

Sindh

State of
Environment &
Development



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Published by:

IUCN Pakistan, Sindh Programme.

IUCN

The World Conservation Union

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Citation:

Sindh State of Environment and Development, IUCN, 2004.
Sindh Programme Office. xxvii+423 pp.

ISBN:

969-8141-64-2

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Cover photos:

Jamshyd Masud, Mohammad Anees Shahzad,
Nasir Ali Panhwar, M. H. Panhwar, Badar Abro
Sindhica Publications and Pakistan Steel Mill

Layout:

Hasan Abbas

Printed:

Rosette Printers, Karachi.

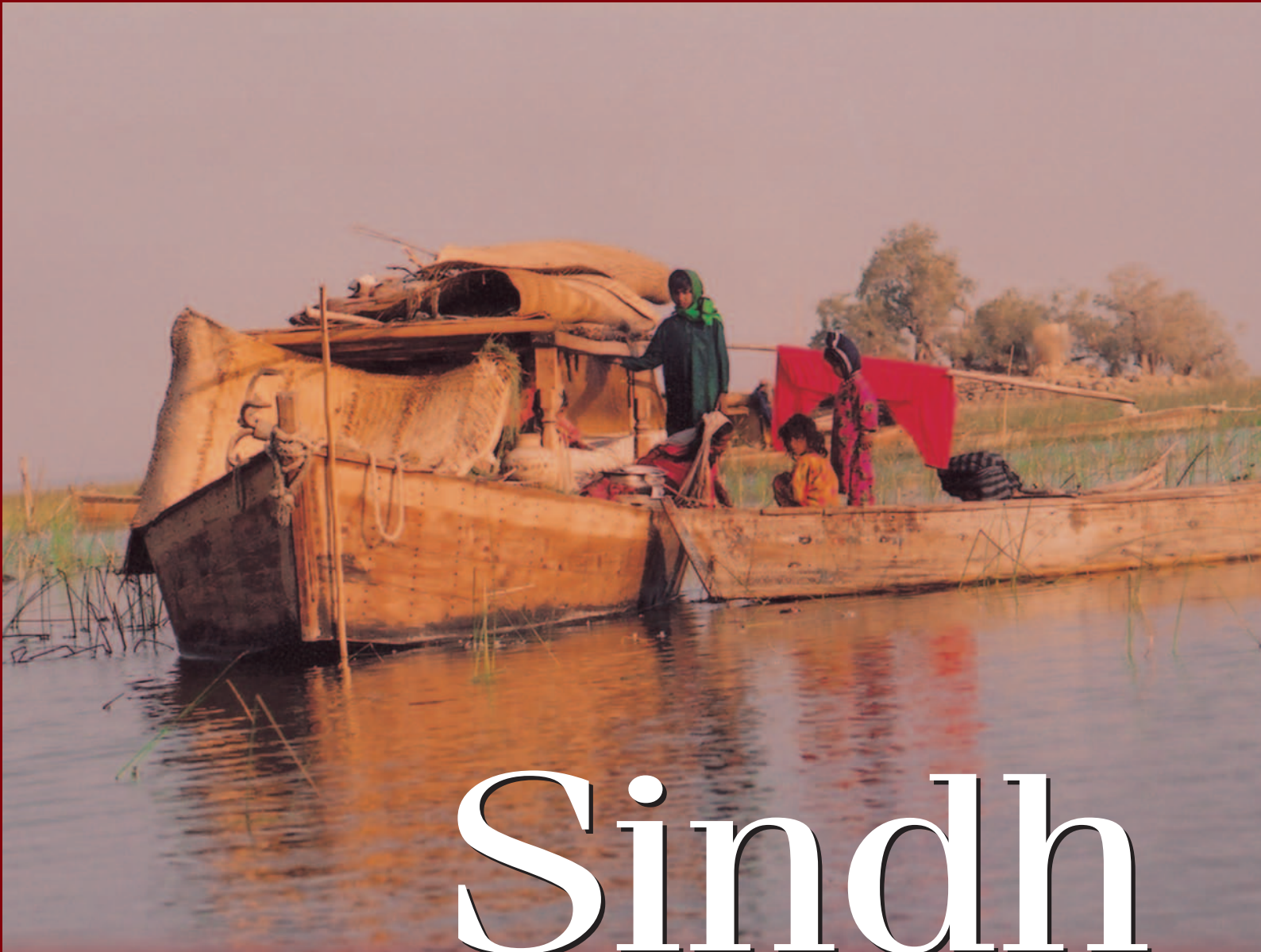
Available from:

IUCN-The World Conservation Union
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Karachi-75530

Tel: ++92-21- 5374072/74/75 Fax: ++92-21-5838106

Website: www.sindh.iucnp.org



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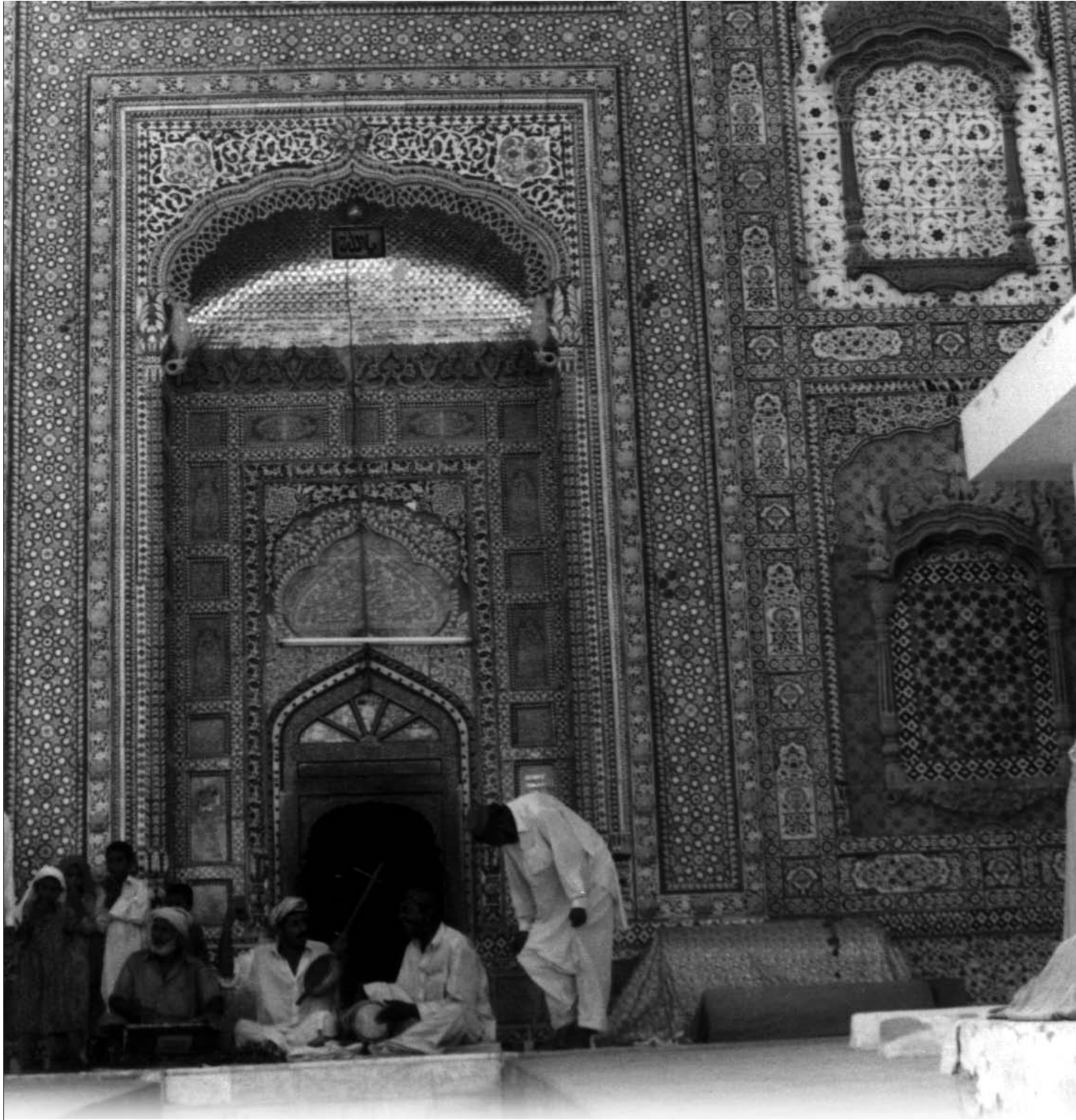
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ABBREVIATIONS

ADB	<u>Asian Development Bank</u>	CO	<u>Community Organization</u>
ADP	<u>Annual Development Plan</u>	CRI	<u>Cotton Research Institute</u>
AICU	<u>Allama Iqbal Open University</u>	DCHD	<u>Democratic Commission for Human Development *</u>
AKRSP	<u>Aga Khan Rural Support Programme</u>	DHA	<u>Defence Housing Authority</u>
AKUH	<u>Aga Khan University Hospital</u>	DoF	<u>Provincial Department of Fisheries</u>
APM	<u>Authority for the Preservation of Mohen-jo-Daro</u>	DMIS	<u>District Management Information System</u>
APM	<u>Agricultural Produce Market</u>	DP	<u>Digestible Protein</u>
APO	<u>Agriculture Pesticides Ordinance</u>	DRC	<u>Drainage Research Centre</u>
APWA	<u>All Pakistan Women's Association</u>	EEC	<u>European Economic Community</u>
ARI	<u>Agriculture Research Institute</u>	EEZ	<u>Exclusive Economic Zone</u>
ATI	<u>Agricultural Training Institutes</u>	EPA	<u>Environmental Protection Agency</u>
BBTV	<u>Banana Bunchy Top Virus</u>	EPZA	<u>Export Processing Zone Authority</u>
BDCC	<u>Bhit Shah Declaration Coordinating Council</u>	FAO	<u>Food and Agriculture Organization</u>
BOC	<u>Burmah Oil Company</u>	FCS	<u>Fishermen's Cooperative Society</u>
BOT	<u>Build, Operate and Transfer</u>	FDI	<u>Foreign Direct Investment</u>
CBD	<u>Convention on Biological Diversity</u>	FSC	<u>Foundation Seed Cell</u>
CBO	<u>Community-Based Organization</u>	FSMP	<u>Forestry Sector Master Plan</u>
CCB	<u>Citizen Community Boards</u>	GDP	<u>Gross Domestic Product</u>
CDC	<u>Centers for Disease Control</u>	GIS	<u>Geographical Information System</u>
CFT	<u>Cubic Feet</u>	GNP	<u>Gross National Product</u>
CITES	<u>Convention on International Trade on Endangered Species</u>	GOP	<u>Government of Pakistan</u>
CLCV	<u>Cotton Leaf Curl Virus</u>	GRP	<u>Gross Regional Product</u>
CMS	<u>Convention on Migratory Species</u>	GRT	<u>Gross Registered Tonnage</u>
CNG	<u>Compressed Natural Gas</u>	GSP	<u>Geological Survey of Pakistan</u>

HANDS	Health and Nutrition Development Society *	KoFHA	Korangi Fisheries Harbour Authority
HDI	Human Development Index	KM	Square Kilometer
HOPE	Health Oriented Preventive Education	KMC	Karachi Municipal Corporation
HRCP	Human Rights Commission of Pakistan	KNP	Krithar National Park
HREP	Human Rights Education Programme *	KPT	Karachi Port Trust
IBIS	Indus Basin Irrigation System	KWSB	Karachi Water Sewage Board
ICZM	Improved Coastal Zone Management	LBOD	Left Bank Outfall Drain
IRC	Indus Resource Centre	LITE	Landhi Industrial Trading Estate
IRSA	Indus River System Authority	m	Million
ISO	International Organisation for Standardisation	MM	Milimetre
ISP	Internet Service Provider	MAF	Million Acre Feet
ISPAK	Internet Service Providers Association of Pakistan	MFD	Marine Fisheries Department
IT	Information Technology	MGD	Million Gallon Daily
IUCN	International Union for Conservation of Nature and Natural Resources *	Mha	Million hectares
KAIRP	<i>Katchi Abadi</i> Improvement and Regularization Programme	MIFB	Mineral Investment Facilitation Board
KANUPP	Karachi Nuclear Power Plant	MICS	Multiple Indicators Cluster Survey
KBCA	Karachi Building Control Authority	MMDS	Multi-point Microwave Distribution System
KCR	Karachi Circular Railway	MPA	Master Plan of Action
KDA	Karachi Development Authority	MSA	Maritime Security Agency
KESC	Karachi Electricity Supply Corporation	MSY	Maximum Sustainable Yield
KFH	Karachi Fish Harbour	NAP	National Access Points
KFHA	Karachi Fisheries Harbour Authority	NARC	National Agriculture Research Centre
		NCAE	National Commission for Alternative Energy
		NCS	National Conservation Strategy
		NCCW	National Council for the Conservation of Wildlife

NEPRA	National Electric Power Regulatory Authority *	PILER	Pakistan Institute of Labour Education and Research
NEQS	National Environmental Quality Standards	PMRC	Pakistan Medical Research Council
NFDB	National Fisheries Development Board	POL	Pakistan Oilfield Limited *
NFM	National Fund to Save Mohen-Jo-Daro	PPIB	Private Power Infrastructure Board *
NHDR	National Human Development Report	PPRSP	Pakistan Poverty Reduction Strategy Paper
NIA	Nuclear Institute of Agriculture	PSEB	Pakistan Software Export Board
NIO	National Institute of Oceanography *	PSMA	Pakistan Sugar Mills Association
NIST	National Institute of Silicon Technology	PSST	Pakistan Society of Sugar Technologists
NLC	National Logistic Cell	PTDC	Pakistan Tourism Development Corporation
NRSP	National Rural Support Programme	QAARI	Quaid-e-Awam Agriculture Research Institute
NWFP	North-West Frontier Province	RBOD	Right Bank Outfall Drain
NWMC	National Wetland Management Committee	RCC	Reinforced Cement Concrete
O&M	Operation and Maintenance	R&D	Research and Development
OGDC	Oil and Gas Development Corporation	RE	Renewable Energy
OPP	Orangi Pilot Project	RRI	Rice Research Institute
PARC	Pakistan Agricultural Research Council	RTI	Research and Training Institute
PASHA	Pakistan Software Houses Association	SAFWCO	Sindh Agriculture and Forestry Workers' Cooperation
PCAT	Pakistan Council for Appropriate Technology	SAU	Sindh Agriculture University
PCRET	Pakistan Council for Renewable Energy Technology	SAZDA	Sindh Arid Zones Development Authority
PCSIR	Pakistan Council of Scientific Industrial Research *	SCARP	Salinity Control and Reclamation Project
PEMRA	Pakistan Electronic Media Regulatory Authority	SCF	Save the Children's Fund
		SHRI	Sindh Horticulture Research Institute

SINGOF	Sindh NGO Federation	VO	Village Organization
SITE	Sindh Industrial Trading Estate	VOIP	Voice Over Internet Protocol
SKAA	Sindh <i>Katchi Abadi</i> Authority	WAF	Women Action Forum *
SLA	Sindh Language Authority	WAPDA	Water and Power Development Authority
SPDC	Social Policy and Development Centre	WRI	Wheat Research Institute
SPO	Strengthening Participatory Organization	WWF	World Wildlife Fund
SRSP	Sindh Rural Support Programme	WES	Water Environmental, Sanitation
SSC	Sindh Seed Corporation	ZSD	Zoological Survey Department
STDC	Sindh Tourism Development Corporation	Local Terms	
SUPARCO	Space and Upper Atmospheric Research Organization	alghoza	a type of musical instrument consisting of two flutes which are paired and played together
SVOC	Stanvoc Oil Company	arthis	middlemen
SWD	Social Welfare Department	baiparis	businessmen
SWD	Sindh Wildlife Department	begar	forced labour without payment
SZABIST	Shaheed Zulfiqar Ali Bhutto Institute of Science and Technology	bhatta	illegal gratification
TA	Technical Assistance	bitharo	a rough kind of prisoner's baseball
TED	Turtle Excluder Device	borindo	an ancient musical wind instrument of the Indus Valley
TDN	Total Digestible Nutrients	chakkies	small flour grinding mills
TDS	Total Dissolved Solids	chang	musical instrument made of iron rods vibrated with player's fingers
TOE	Tons of Oil Equivalent	chapri	musical instrument consisting of two wooden flanks and small ringing bells
ToR	Terms of Reference	chukar	blue rock
TRC	Teacher's Resource Centre	chowki	check post
TRDP	Thardeep Rural Development Programme	dambooro	a guitar-like musical instrument with fine strings
TVO	Trust for Voluntary Organizations	deh	smallest unit of land (Deh, Tapa, Taluka, District)
USAID	United States Agency for International Development		

desi	<u>local</u>	melas	<u>local festivals</u>
dharo	<u>mound</u>	mohallas	<u>neighbourhoods</u>
dhamal	<u>a type of ecstatic dance</u>	naib	<u>deputy</u>
dhol	<u>drum</u>	nain	<u>hill torrents</u>
dholak	<u>a small drum</u>	nalas	<u>natural drains</u>
dhoti	<u>wrap-around</u>	nar	<u>major creek</u>
dubari	<u>a piece of land producing two crops</u>	nafeel	<u>a musical instrument of mystics made from the horns of an Ibex</u>
dupatta	<u>scarf</u>	nazims	<u>mayor</u>
Eid-ul-Azha	<u>Muslim festival</u>	paras	<u>small settlements</u>
garha	<u>an earthen pot played like a <i>tabla</i></u>	patt	<u>barren land</u>
gharana	<u>family (particularly of singers)</u>	Phog	<u>plant (alligonom polygonoides)</u>
ghee	<u>purified butter</u>	rabi	<u>winter crop/season</u>
gili dakar	<u>a game played with sticks</u>	sarangi	<u>a musical instrument</u>
goth	<u>village</u>	shaanai	<u>a musical instrument similar to a flute</u>
haris	<u>peasants</u>	sufi	<u>saint</u>
ho jamalo	<u>a Sindhi folk dance/song</u>	sur	<u>musical tune</u>
jhummir	<u>a Sindhi dance performed by men/women</u>	taluka	<u>district</u>
kabaris	<u>waste buyers</u>	taries	<u>a natural depression where rainwater gathers</u>
kafi	<u>a classical verse in Sindhi</u>	tehsil	<u>sub-district</u>
kamarband	<u>drawstring</u>	tootoori	<u>a flute-like instrument</u>
kashi	<u>glazed pottery tile</u>	yaktara	<u>a single-stringed musical instrument (Urdu)</u>
katchi abadis	<u>squatter settlements</u>	yaktaro	<u>Sindhi version of <i>yaktara</i></u>
kharif	<u>summer crop/season</u>	zakat	<u>Muslim charity tax</u>
kutchra kundis	<u>garbage dumps</u>	zila	<u>district</u>
leh	<u>rhythm</u>		
madrassahs	<u>religious schools</u>		
malakahkro	<u>wrestling event, typical to Sindh</u>		



P R E F A C E

The increase in interest in environmental issues such as the greenhouse effect, global warming, ozone layer depletion, decrease in forest cover and biodiversity loss has brought the importance of environmental conservation to the forefront. This is the reason that efforts are now being made to understand these issues and resolve them by formulating and implementing policies for industries and governments that minimize environmental degradation. It is also now realized that development cannot take place at the cost of our natural environment. If Pakistan is to join the ranks of developed countries it must first put itself on the path of sustainable development.

Sindh is a province rich in natural resources and like the rest of Pakistan, it is also impacted by various issues related to the degradation of its environment and unsustainable development. IUCN Pakistan's Sindh Programme has

developed this report on the State of Environment and Development in Sindh (SoED), the objective of which is to provide information on the status of environment and development in the Province. The idea is that before any action can be undertaken to address the various issues prevalent in Sindh, the first step is to collect and publish all the existing data in one document. This would provide a basis to further undertake studies and update information on various sectors. This document will be a valuable tool for development planners as a baseline resource on the state of the environment and for the sustainable development of the Province.

It is hoped that this report will influence the development of the Sindh Strategy for Sustainable Development with an emphasis on poverty reduction and relevant livelihoods strategies for the people of the Province.



FOREWORD

The Government of Sindh is aware of the importance of environmental conservation and acknowledges the fact that for sustainable development of the Province it is necessary to take immediate action to ensure optimal use of available resources. Many issues such as the sea intrusion into the Indus Delta, air and water pollution degrade natural resources, ultimately affecting livelihoods. For the prosperity of the province of Sindh, equitable and effective management of our natural environment is required.

In this context the Provincial Government has initiated and implemented many projects related to sustainable development, with a special emphasis on poverty reduction and sustainable livelihoods. As part of the Vision 2015, the necessity to formulate a strategy for the conservation of natural resources has also been realised. There is a dire need for greater public participation in development and environmental management.

The first step to achieve these goals was to collect and collate information on various environment and development issues of the Province. Therefore, the Planning and Development Department, (P&DD) Government of Sindh is very proud that the *State of Environment and Development of Sindh (SoED)* has been developed. This document provides succinct, up to date information about trends, issues and status of

various sectors in the Province. In light of the Vision 2015, we hope that this document would prove to be a good source of information and serve as a reference guide for all development initiatives. The SoED can also be used as a yardstick to measure future changes in the province. We see this document as a first step to the development of the Sindh Strategy for Sustainable Development, which is also being developed in collaboration with IUCN Sindh Programme.

It was developed with wide stakeholder participation of both government and civil society and the P&DD together with IUCN was part of the whole process of consultative workshops and development of sector papers.

We would like to acknowledge the technical assistance of IUCN Pakistan Sindh Programme in developing this document. We also appreciate the work it has undertaken for the sustainable development of Sindh. The P&DD looks forward to supporting all sustainable development initiatives in the Province and further collaboration with IUCN for a more sustainable Sindh.

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Karachi



ACKNOWLEDGEMENTS

The State of Environment and Development (SoED) of Sindh has been developed through wide stakeholder participation and with input from various experts. We extend our profound thanks to the experts who developed the sector papers that were a pre-requisite to developing the SoED of Sindh.

We are thankful to all the stakeholders who took the time to attend the consultative workshops and provided us with an in-depth analysis of the various issues addressed in the sector papers. Without their contribution, it would not have been possible to have complete and holistic information for all key sectors.

The Sindh Programme Office team, composed of Ali Raza Rizvi, Nasir Ali Panhwar, Saima Pervaiz Baig, Sana Raza, Shahana Jamil, Najia A. Siddiqui and Tahir Qureshi, coordinated the development of the papers, workshops and also undertook the final responsibility of editing and printing this report.

The IUCN “family” members provided immense support and guidance at various phases of the

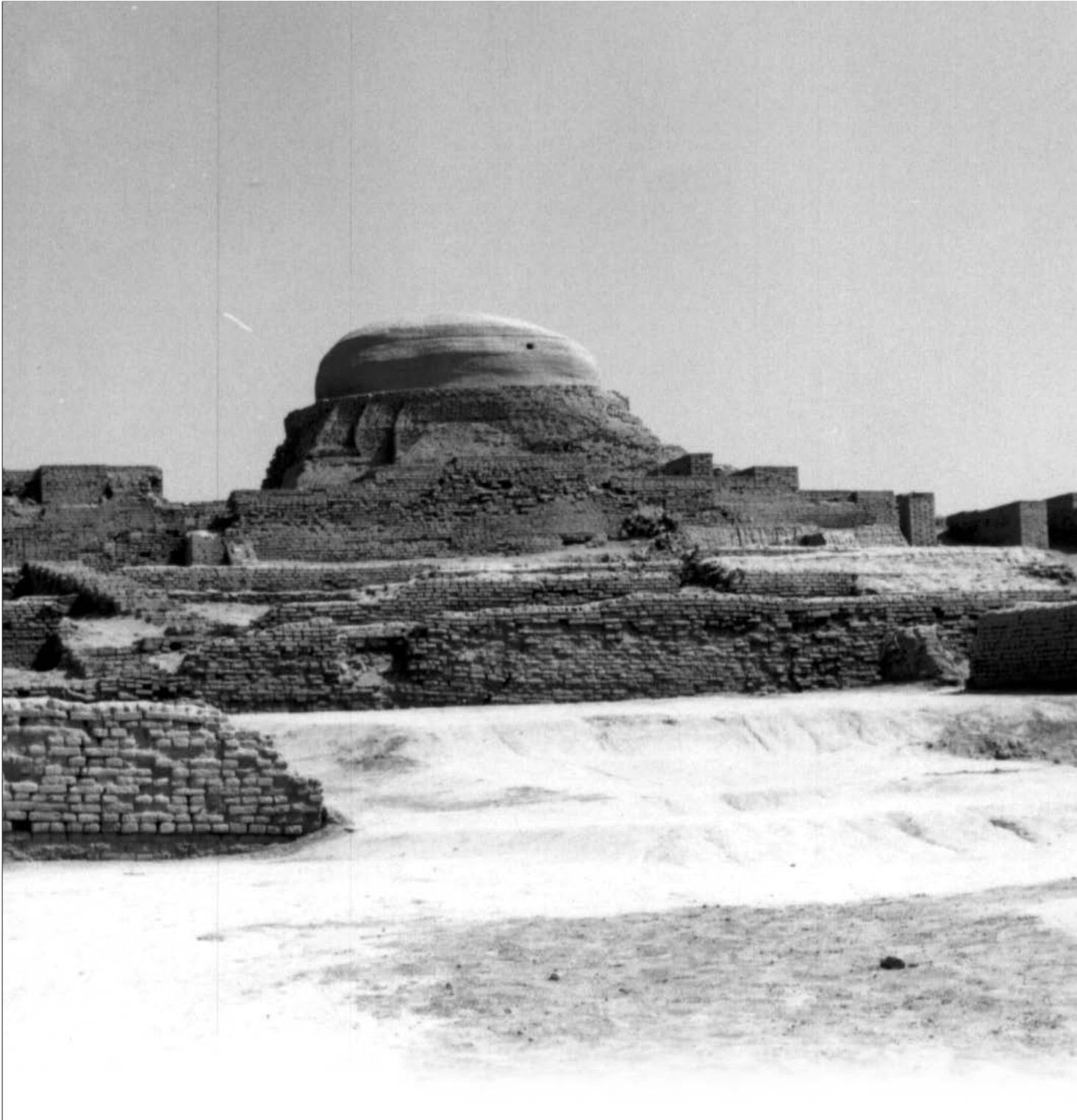
process. Particular thanks are due to Ms. Aban Marker Kabraji, Regional Director for Asia, and other members including Abdul Latif Rao, Mohammed Rafiq, Gul Najam Jamy, Dhunmai Cowasjee, Zohra Rehmat Ali and Azhar Saeed.

We are very grateful to Arif Hassan who took on the gargantuan task of putting together this report, for editing various sector papers for inclusion and for also writing some chapters. His expertise and knowledge played a large part in giving this report its final shape. Thanks are due to Zofeen Ebrahim and Samina Choonara who assisted in reviewing and editing. We would also like to extend our particular gratitude to the following:

Mr. Ghulam Sarwar Khero, Additional Chief Secretary (Dev), Government of Sindh.

Mr. Shams ul Haq Memon, Secretary Environment & Alternate Energy, Government of Sindh.

Mr. Mohammed Hashim Leghari, Secretary Education, Government of Sindh.



EXECUTIVE SUMMARY

Sindh, Pakistan's second largest province, plays an important role in the national economic and development agenda. The country's largest city, Karachi, which also houses both its ports, is located here. The province contains 23 percent of Pakistan's population and 17.7 percent of its land area. With 48.9 percent, it has the highest concentration of urban population as opposed to an overall average of 32.5 percent, making it the most urbanised province in the country. Sindh is also a cultural melting pot, where migrants from other provinces have settled in search of opportunities and have brought along their own traditions and languages.

The province contains a mere 23 percent of Pakistan's population; however, its contribution to Pakistan's economy is much higher. Sindh collects 70 percent of Pakistan's income tax and 62 percent of sales tax. A major share of Pakistan's industry, oil and gas fields, livestock and fisheries are located in Sindh.

Physiographically, Sindh comprises of the Lower Indus Basin. It can be divided into four distinct parts with the Kirthar mountain range in the west, a central alluvial plain bisected by the River Indus in the middle, the desert belt of Tharparkar in the east, and the Indus Delta in the south. The climate of Sindh is consistent with the typical weather of tropical regions of low and dry lands. Temperatures are exceptionally high in summer but comparatively low in winter. Upper Sindh is dry, with considerable variations of temperature in winter. The climate is relatively moderate in the lower areas and in the midsection of the province. Rainfall is scarce in the province as a whole, varying between 100 to 200 mm per year.

The diverse population of Sindh consists of the descendants of various races (Aryans, Sakas, Huns, Arabs, Baloch and more recently migrants from India) who have either invaded or settled here over the last three thousand years. Sixty percent of the population of the province

communicates in Sindhi, 21 percent is Urdu speaking and 7 percent speaks Punjabi as its mother tongue. Sindhi is spoken widely in the rural areas where it is the first language of 92 percent of the population. These percentages vary in the urban areas as 50 percent of the city dwellers speak Urdu. Social and physical indicators for rural and urban areas diverge as well. For example, 55.69 percent of rural homes have no access to latrines. In the urban areas, this figure is 5.7 percent. About 52.62 percent of rural homes have electricity as opposed to 93 percent in the urban areas. Female literacy stands at 12.23 percent in the rural areas while 56.66 percent females in the urban areas are literate. Urban population growth is considerably higher, 3.5 percent per year, than the staggering rural growth of 2.2 percent per year.

Karachi, the capital of the province and the country's only sea port, contains 30 percent of Sindh's total population and 63 percent of its urban population. As a result, it exercises a strong influence on the economy and employment patterns in the province. Industries have failed to develop in other parts of Sindh owing to the influx of the skilled and educated people from the rural areas to Karachi for employment purposes. This migratory process is further impoverishing the rural areas.

Sindh's natural endowments consist mainly of agriculture, fisheries, livestock and poultry, arid zones, wetlands, coastal and marine ecosystems, water resources, flora and wildlife. The natural assets of the province and the environment they subsist in are under stress due to poor management; lack of financial and human resources within state institutions; bureaucratic red-tape; a powerful nexus between politicians, bureaucratic and feudal interests; and the non-involvement of communities in the management and development process. Increasing poverty and unemployment further restrict sustainable natural resource management.

Indus water is crucial to Sindh's survival as 95 percent of its farmland acquires water from the Indus Basin Irrigation System (IBIS) and 97 percent of all water is used for agriculture. The groundwater available in Sindh accounts to only three to five MAF and is potable only in 28 percent of Sindh's geographical area.

According to the 1991 Water Accord between the provinces, Sindh was awarded 48.76 MAF yearly from the IBIS. However, it has received much less than this due to the non-implementation of the Water Accord as well as the persistence of drought. The most severely affected area in the province is the Indus Delta which has shrunk to ten percent of its original size due to the construction of dams and barrages on the Indus. Sindh is plagued by acute water insecurity. In 1971-72, when Sindh's population was 14.156 million, water availability was 39.3 MAF. In 1998-99, when the population rose to 30 million, water availability was reduced to 48.5 million. The water problem is further aggravated by defective irrigation practices like flood irrigation, lack of drainage facilities and the absence of properly organised management and distribution of this resource. The absence of lining in canals and water channels result in leakages that cause water-logging and seepage in the urban water transmission and distribution system. Meanwhile, sea intrusion in the delta has made most of the subsoil in the aquifer saline.

Sindh is a major producer of grain, fruit and vegetables. However, crop yields are low and have been almost stagnant for the last decade. This is due to salinity caused by leakages from canals and from sea intrusion in the delta and coastal districts. Over irrigation and badly managed water distribution also contribute to poor crop yield. An increase in the use of fertilisers and pesticides has been witnessed, which has led to land degradation and depletion of organic matter in the soil. The application of pesticides and broad spectrum chemicals has led to many pest outbreaks, damaging human health and the environment by killing non-target bio-control agents, environmental friendly organisms, and birds. In addition, much of the fertilisers and pesticides are substandard and the Directorate of Plant Protection and Agriculture Extension have not been able to effectively control their production and use.

Academic institutions, laboratories and research facilities exist in the agricultural sector. In addition, private sector companies also carry out research. Tando Jam Agricultural University has a student population of over four thousand and considerable research facilities. However, budgets for this purpose have been reduced

drastically since 1994-95. Agriculture extension budgets have increased by a mere 22 percent in the last ten years. The foremost issues of this sector are the management of plant viruses, agri-research management, the large yield gap and the high cost of production. The exorbitant costs of seed, fertiliser and pesticide account for elevated production costs. Poverty forces farmers to borrow money from *arthis* and *bayparis* for production purposes at high rates of interest or alternatively, to sell their produce at much lower than the market price in exchange for credit.

Sindh holds a primary position in Pakistan in fisheries. Of Pakistan's 1,050 km coastline, including the Indus Delta, 350 km is in Sindh. In addition, almost 100 percent of the brackish, 65 percent of the freshwater and 71 percent marine fish resources of Pakistan are in Sindh. Over sixteen thousand boats of all categories are engaged in fishing along the coast. However, the sector faces a number of constraints. Attempts for the diversification of resources to culture fisheries have not been made even though these steps would reduce demands on wild stock which is under increased pressure. A number of development projects for this purpose were executed but they were unsuccessful and as a result the sector is in debt of over \$120 million dollars in foreign loans, borrowed mainly for Sindh. There is also an absence of credit facilities for the fish farming industry and a dearth of trained human resources.

Many training facilities (such as Fishermen Marine Training School, extension centres for upper and lower Sindh) are no longer operational or have been abandoned. Furthermore, the equipment procured during the execution of development projects was not properly utilised. There is also an acute shortage of landing facilities along the coast. All this points to a major planning, implementation and management problem accompanied by a lack of political will. In addition, the absence of water in the Indus delta has adversely affected the fishing communities and the fish nurseries in the mangrove swamps. As a result, many species such as the *palla*, are under threat. Commercial fishing (especially of shrimps) and illegal fishing by foreign trawlers off Pakistan's coast are further depleting stocks. Coinciding

with these problems is the poverty of fishing communities who are in debt to contractors that purchase fishing rights from the government. A change in the contracting system is required to benefit the ruthlessly exploited fishing communities.

Sindh contains a sizeable proportion of Pakistan's livestock and poultry. For example, 27 percent cattle, 28 percent buffalo and 40 percent of poultry are located in Sindh. There has been a considerable increase in the number of livestock and poultry in Sindh but there has been no improvement in the production performance of the breeds. Research and extension facilities required for this need to be set up. A disease prevention network in the form of veterinary hospitals, dispensaries, veterinary centres at district, taluka and union council levels, exists. However, vaccines at these centres are inadequate, disease diagnosis and monitoring systems are weak, and extension is poor. Annual Development Plan (ADP) funding for the sector has been steadily declining and is not being replaced by other private sector arrangements.

Sindh's arid zones consist of Thar, Nara and Kohistan areas. The majority of the arid zone population is engaged in herding and relies on the rangelands which provide more than 70 percent of the forage for the animals. Agriculture is rain fed and rains are erratic. Previously, the desert populations migrated to the Indus flood plains during the dry periods and this helped in the protection of rangelands from over-grazing. It also provided an alternative habitat during periods of prolonged drought. In addition, rangelands were managed and protected by a powerful feudal authority which also arranged for the maintenance and building of water conservation and storage infrastructure. Due to a change from barter to a cash economy, the power of the feudal authority in fulfilling its environment and development related functions has almost disappeared and has not been replaced by community-based alternatives. The flood plains of the Indus have been colonised and no longer provide a safety valve for the arid zone communities. The introduction of the cash economy has increased the number of animals in order to increase the availability of cash. All these factors have

contributed to an over-exploitation of the rangelands and in an increasing number of cases, their desertification. Due to these factors, the desert communities have become extremely vulnerable especially during periods of drought. According to surveys the majority of households are in debt to moneylenders. It has been observed that in areas where road infrastructure exists, arid zone communities are able to strike a more equitable relationship with the middlemen who purchase their animals, sell them fodder, and lend money in times of drought. Solutions to these problems have been initiated by Thardeep, a local Thari NGO, through community mobilisation for rangeland management, building and maintenance of water conservation and storage, alternative livelihoods, community savings and credit schemes.

Eight percent of Sindh's geographical area consists of forests. These forests are of three kinds: riverine forests, mangrove forests and irrigated plantations. The riverine forests have been degraded due to the building of dams and barrages on the Indus and the irrigation system. A recent drought has further thinned them out. The mangrove forests in the Indus Delta are the sixth largest in the world. They have decreased from 263 thousand hectares in 1977 to 160 thousand hectares in 1991. This is primarily due to the lack of freshwater from the Indus flushing the delta and the resulting sea intrusion. Irrigated plantations, initiated with the assistance of the Asian Development Bank, have been increasing, but at a very slow pace. In any case, they constitute a very small percentage (7.25 percent) of the forest area of Sindh and are not an ecological alternative to the natural forests.

The forestry sector is under threat. There has been gross mismanagement of the sector by the government's Forest Department. A nexus between forest contractors, officials of the forestry department and local feudals has led to illegal exploitation of forest resources and in many cases illegal occupation. This process has been aggravated by the poverty and landlessness of local communities and an unfavourable security situation in the province. The present management system in the forest department does not allow for independent and professionally sound work in the interest of

forests and communities. It is centralised and the revenue generated is not re-invested in the harvested forest area. These issues demotivate professionals and employees of the department. To make matters worse, long periods of drought in recent years and reduced inundation coupled with increasing transpiration, due to rising temperatures, have taken their toll. The building of the Left and the Right Bank Outfall Drain (LBOD & RBOD) offer opportunities for introducing species (such as the Australian Acacias) that can grow in saline and waterlogged conditions. Social forestry, both through the Sindh Forest Department and the private sector, has shown signs of success and needs to be promoted.

The wetlands of Sindh serve as spawning, rearing and nursery grounds for the production of shrimps, lobsters and fish. During the migration season over one million waterfowl from 108 species use these wetlands. Eight of the nineteen Ramsar wetland sites in Pakistan are located in Sindh. Wetlands are under stress for a variety of reasons. Local communities harvest their fauna and flora for food and economic gain. The population of such communities is rapidly increasing due to high population growth rates. The damming of the Indus has affected these areas adversely since discharge of both sediment and water has reduced considerably. This has also caused sea water intrusion and waterlogging in the coastal districts due to which many locations have become so saline that they are unable to support any bird or plant life. Excessive use of water for agriculture also deprives wetlands of their share. The water that does reach the wetlands often contains fertiliser and pesticide runoff. Added to these factors is uncontrolled hunting and the growth of unplanned human settlements around them which discharge their sewage and industrial affluent into the wetlands.

Sindh's coastline can be divided into two: the Indus Delta and the Karachi mega-city coast which lies between the Hub River and the Indus Delta. Much of the problems of the delta area are related to a lack of water in the Indus below Kotri and have already been explained. The LBOD and the RBOD are contributing to the problems confronting the Indus Delta coast. The LBOD discharges into the Shah Samdoo Creek and is adversely affecting the coast. The RBOD

is to discharge near the Ghara Creek which is already stressed due to Karachi's heavy industrial and port activities. The dilemmas of the Karachi coast are different from that of the delta. This coast contains two major ports, the Karachi Port and the Mohammad Bin Qasim Port. Both these ports are responsible for oil pollution of the coastal region. In addition, Karachi's industrial areas (SITE, Landhi-Korangi, Pakistan Steel Mills) discharge effluents that carry heavy metal, organic matter and toxic chemicals, into the sea. There is also thermal pollution from the Karachi Nuclear Power Plant and other heavy industries that use sea water for cooling and discharge it back at high temperatures after use. Solid waste is also dumped into the sea and untreated sewage (only 20 percent of Karachi's sewage is treated) finds its way to the sea through the natural drainage system. Due to these reasons the flora and fauna of the Karachi coast have been adversely affected and their recreational potential and aesthetic quality has been undermined. A master plan for Karachi as a whole and for the coast in particular is required, along with the implementation of the Environmental Protection Act, to improve conditions. This requires close coordination between the numerous federal, provincial and local agencies that operate in the city.

Sindh is also experiencing a depletion of its floral resources at an increasingly high rate because of a rise in both human and animal population which results in over-exploitation. The absence of affordable energy options is a major factor along with the decreasing freshwater to the Indus Delta. As mentioned in the paragraphs above, the riverine areas, swamps, deserts and the Indus Delta where flora is located are all under stress. Although proper legislations exist, like the Forest Act, NEQS and the Wildlife Protection Act, their implementation and enforcement is weak, hampered by political interests and feudal influences. The administrative set-up is run on an ad hoc basis, with limited budgets and few trained persons.

Sindh's Wildlife is threatened by similar adversities faced by flora resources in the province. A number of important NGOs that work in close collaboration with government agencies and the corporate sector have

initiated pilot projects for the conservation of wetlands, flora and wildlife.

Sindh is a major producer of oil and gas. Fifty-six percent of Pakistan's daily production of oil and 37 percent of gas is produced in Sindh. Limestone is found all over the province and is mined extensively for cement production. There are also large deposits of coal and lignite in upper Rannikot, Meting Jhimpir, Lakhra and Thar. The Thar deposits have yet to be mined and are estimated to be the largest in Pakistan. Foreign investment in the mining sector is increasing and between 1999-2000 and 2001-2002, it increased from \$79.7 million to \$121.7 million dollars.

Mining in Sindh has caused deforestation and displacement of the local poverty stricken communities. It has also caused large scale environmental degradation. Much of this is because the private companies involved in mining have not been concerned about its social and environmental repercussions. Rural communities which are affected by mining activities are poor and disorganised, and do not have the support of concerned civil society organisations. Thardeep, a Thar NGO, has recently prepared a report on the environmental repercussions of mining in Thar and it is hoped that the concerns and recommendations of this report will be considered by the authorities and that in the future similar reports will be made for other mining projects as well. Such initiatives are important since both multinational companies and domestic private prospectors are increasingly showing interest in the mining sector.

There are other daunting threats for the locals as well. Mining processes in Pakistan are obsolete, slow and outdated. Abandoned mines pose problems and a number of people have died due to their collapse. Lack of safety for workers due to non-implementation of mine safety laws also results in regular deaths. In addition, pollution from mines causes changes in the chemistry of groundwater which results in an increase in water-borne diseases.

Urbanisation in Sindh is a major environmental issue as 48.9 percent of the province resides in urban areas. Karachi alone contains 63 percent of Sindh's urban population. A large

housing demand-supply gap has resulted in the development of *katchi abadis*. The rapid and uncontrolled growth of the city has resulted in unregulated development and inappropriate land-use changes. In Karachi, more than 50 percent of its population lives in informal settlements. Master plans for Karachi and Sindh's secondary cities have been developed but they have never been implemented or given legal cover. In addition, planning and building control institutions have been ineffectual. Building by-laws and zoning regulations are violated due to a powerful nexus between politicians, bureaucrats and developers. The cities and towns do not have space for cargo terminals, transport facilities, small scale manufacturing and warehousing. These have developed in the inner cities creating immense environmental degradation, inappropriate land-use changes and the demolition of much of Sindh's built-heritage which lies within the inner cities.

Water for most of Sindh's cities comes from river and canal sources. Acute shortages occur during periods of drought and per capita availability is decreasing. Water sources are increasingly polluted due to untreated industrial and domestic wastes being disposed into the rivers and irrigation systems. Sewage treatment plants have not been built, and even where they exist, as in Karachi, Hyderabad and Sukkur, effluent does not reach them due to faulty planning. Only 30 to 40 percent of all solid waste is lifted by the municipalities and there are no properly organised landfill sites in the province. Fortunately, Sindh has a large garbage recycling industry in the informal sector due to which much of the inorganic waste is recycled. This industry, however, needs support to make it function better.

The absence of a rail based mass transit system for Karachi and efficient transport facilities also poses immense problems for the commuting public and is the major cause for stress related diseases. The lack of efficient and comfortable transport induces people to purchase cars and motorcycles, creating congestion and air pollution. Noise and air pollution in Karachi, and at various locations in Sindh's secondary cities, is considerably higher than acceptable levels. Mega projects, such as the Lyari Expressway, and illegal land use

conversions, evict a large number of poor communities from their homes, in some cases from locations they have occupied for over two hundred years. However, Karachi has an active civil society and a number of NGOs are involved in community development and urban planning-related advocacy work.

Sindh is a major contributor to industrial production in Pakistan as 60 percent of Pakistan's industry is located in Karachi. In addition, it has a vast network of agro-based industries such as flour, rice, edible oil, cotton ginning, brick kilns, and livestock products and heavy industries including sugar, cement, cotton yarn, textiles, cloth, cigarettes, tanning, pharmaceuticals, and steel mills. However, Sindh's industrial units, except those concerned with consumer products, have been closing down because of: increases in the cost of production; a deteriorating law and order situation; investors having taken advantage of bank loans and preferring to declare their units sick; and discontinuation of previously granted tax holidays. Due to these reasons, there is a shift from manufacturing to trading or service industries. Structural adjustment, privatisation and adjustments due to the WTO regime have also adversely affected industrialisation. Foreign investments have not materialised except for the oil, gas, fast food and tobacco industries. The formal sector industries have also been adversely affected by smuggled goods made possible mainly through the Afghan Transit Trade, second quality products from the informal production sector which contributes 50 percent of Sindh's production and inadequate infrastructure. Non-availability of credit and cash flow, including foreign exchange, has also resulted in lack of confidence in the investment market. As a result of these factors, an increasing number of industries are closing down and unemployment is rampant. In addition, noise and air emissions and the discharge of hazardous effluents far exceed allowable NEQS. Industrial solid waste collection and disposal is also nonexistent and it is not treated as a separate component from domestic waste.

Only five percent of monthly income is spent on energy demonstrating the deplorable living conditions in Sindh. This is in spite of the fact that Sindh has replaced Balochistan as a major

producer of gas and that it has the largest coal deposits in Pakistan. Although its electricity capacity has been increasing, its consumption has been almost static since 1995-96. Two out of five oil refineries in Pakistan are located in Sindh. However, their outputs are declining since they are old and outdated.

Fifty-two percent of energy utilised in the household sector in Sindh is firewood. The figure speaks for itself and the result of this practice is deforestation. It is difficult to replace firewood in a sustainable manner with alternatives since both oil and gas are being depleted rapidly. There is an urgent need to diversify and such diversification can take place through the use of wind and solar energy options. However, in spite of good research centres in both the private and public sector, alternative energy development has not gone beyond the development of some very effective pilot projects. This is because of weak institutional arrangements for extension and the absence of political will.

Sindh has a rich cultural heritage. Its built heritage consists of some of the most important archaeological sites in the world. However, only a small percentage of these sites are protected, and even these are being adversely affected by the unregulated growth of human settlements and/or waterlogging and soil degradation. The unprotected sites are being lost through vandalism and their materials are being used for building new buildings. The provincial archaeological department looks after these monuments and sites but its funds have not increased in proportion to inflation and devaluation of the rupee and it is increasingly finance starved. Sindh's old towns contain beautiful examples of both pre-British and colonial buildings and neighbourhoods. However, due to an absence of urban planning, violation of building by-laws and non-implementation of zoning regulations, the inner cities of Sindh, where this cultural heritage is located, are under stress. Much of their built-heritage has already been lost. The Sindh Cultural Heritage (Preservation) Act 1994, through which a number of buildings have been listed, offers some hope. However, funds and expertise for setting up the institutional infrastructure required for the enactment of the act are not available.

Folk festivals, usually organised around the urs of saints, are becoming increasingly larger events with participation of the public, private, social sectors and commercial enterprises. These events are accompanied by Sindhi musical functions and traditional sport. Better organisation of these events would attract a larger audience and would also go a long way in the promotion of Sindhi culture and art. The newly created television satellite channels, especially the KTN, are also promoting Sindhi music and dance.

Sindh's arts and crafts, famous in history, consist of textiles, embroidery, glazed tiles and pottery in floral and geometric designs, and timber carvings. Much of these were used traditionally for household items, to embellish boats and animal drawn carts and also in architecture. Although textile production has increased and become commercially viable, Sindh's crafts are no longer used in architecture where there is immense scope for them. Embroidery and weaving of shawls and blankets is also becoming a commercial activity but is financed and marketed by an exploitative system controlled by middlemen.

Given declining environmental conditions, environmental health is also deteriorating in Sindh. In 1997, only 16 percent of the water samples in a survey carried out in Karachi, were considered fit for drinking, and in a survey in the Thatta, Badin and Tharparkar districts, 100 percent of the samples were contaminated. Such severe water pollution results in various enteric diseases which are common in Sindh, especially among children. Studies have revealed that 94 percent children develop IgG antibodies against hepatitis A virus by the time they are three years old. In Karachi, more than 6,000 industrial units accounting for 60 percent of the country's industries are located along the coastal belt and the Indus Delta. With the exception of a few, most industrial units discharge their untreated effluent containing heavy metals and their compounds directly into the water bodies that release them into the sea. Surveys have established that the marine environment around Karachi is highly toxic and that fish and shrimps accumulate a high degree of lead from heavy metals. Studies have also revealed that vegetable samples from farms located along the Lyari and Malir rivers have

high levels of zinc and copper. Polluted air, contaminated water, living conditions in overcrowded and underserved settlements, as well as an inadequate diet, are all factors that deteriorate the overall health situation of people living in the province. The development of appropriate infrastructure and the implementation of institutional arrangements to promote planning and implementation of NEQS is required to improve environmental health conditions.

In terms of the Human Development Index (HDI) ranking within Pakistan, the urban areas of Sindh have the highest ranking with a HDI of 0.659, greater than for Pakistan as a whole. But the rural areas of Sindh have an HDI of 0.456, which is the lowest in Pakistan. This suggests a larger urban-rural disparity than in any other province of Pakistan. There are indications that over two-thirds of the households in rural Sindh may be classified as vulnerable in spite of the fact that Sindh has the highest per capita income in Pakistan. There is a correlation between high incomes and urbanisation, especially in Karachi. Moreover, more than 11 million men and women in Sindh are unemployed and around 15 million live below the poverty line. The unemployment ratio in Sindh was 25 percent during the 1980's but has increased to 33 percent in the 1990's. The privatisation of public owned enterprises and institutions has contributed to unemployment. Persisting drought conditions, crippling tax structures imposed under the influence of IMF and World Bank reforms, fluctuations in the exchange value of the rupee, a breakdown of infrastructure, and a failure to control lawlessness have all caused a major economic recession. It has also adversely affected public spending on social and physical infrastructure related to sanitation, water supply, health and education. Sindh's child mortality rate is 109 per 1,000 live births as compared to a national average of 103. It is unlikely that the targets set by the Poverty Alleviation Programme and the Pakistan Poverty Reduction Strategy Paper will be achieved in the absence of effective institutions and governance systems. Meanwhile, Sindh's population is growing not only due to natural growth but, unlike the rest of Pakistan, due to migration from other provinces and also from other countries such as Bangladesh, Burma and Afghanistan.

The state of education in Sindh is best reflected in its literacy figures and in the serious disparity between rural and urban areas. The provincial literacy average in Sindh is 65.2 percent as opposed to the national average of 46.7 percent. Karachi today has literacy figures of 71.7 percent for men and 71.4 percent for women whereas rural literacy, according to the 1998 Census, is 37.89 percent for men and 12.23 percent for women. The public education sector at the school level is facing major constraints because from the 1990's onwards, there has been a continual decrease in public spending on school education. In 2001-02, the allocation of Rs. 1,150 million for public sector school education was reduced to Rs. 643 million by the provincial government. Thirty percent of public sector schools are without buildings, 34 percent without electricity, 15 percent without water, and 33 percent without toilets. Sindh has the largest number of ghost schools in the country and at least 700 ghost teachers draw government salaries. In 1992, at 47.2 percent, Sindh had the lowest enrollment ratio for primary schooling in all the provinces. In addition, the student-teacher ratio for Sindh in 1999 was also the worst, falling behind by over 10 points as compared to all the other provinces. This has led to overcrowded classrooms, falling standards of instruction and evaluation, and greater drop out rates in primary and secondary schools. This gap in school education is filled increasingly by the private sector. Only 10 percent of private sector schools have science and computer laboratories, libraries, auditoriums and hostel facilities. Since they are not regulated, many of their teachers are simply matriculates, paid as little as Rs.1,000 per month and have no job security. The demand-supply gap is also filled by *madrassahs*, the number of which has risen from 2,801 in 1988 to 9,880 in 2002. With an increase in levels of poverty over the last decade, more children drop out of school to help their families by engaging in economic activity. Many children, especially girls, do not attend school for lack of parental permission and/or an inability to afford schooling.

In terms of graduate degree awarding colleges, professional colleges, technical institutions and postgraduate colleges, there has been a decrease in the number of functional institutions and in enrollment figures of students. The major

reason for this is the emphasis on primary and secondary level education at the expense of the tertiary level. In addition, the government has been moving towards privatisation of higher education upon the recommendations of a task force set up in early 2002 to study the problems and suggest higher education reforms. The removal of subsidies was also suggested by the task force.

If these measures are implemented, higher education will become unaffordable for the poorer echelons of society and make social and economic mobility difficult, if not impossible. The demand-supply gap in higher education is being supplemented by expensive private universities which are beyond the means of a majority of Sindh's population. These government policies are increasing the rich-poor divide.

There is also an acute shortage of technical and vocational training institutes. Only two such institutes have been added over a period of four years and the enrollment actually went down between 1996-97 and 1998-99. Teacher training schools also show a similar trend. Meanwhile, with a systematic degradation of public sector universities since the mid-1980s, all research institutions have lost their independence and thereby the quality of research being undertaken has faltered. This vacuum has been filled to some extent by private sector research and development institutions often affiliated with NGOs but they are increasingly narrowly focused and thematic. Donor agencies such as the World Bank, ADB, Canadian CIDA, DFID and others, have stepped in to promote public-private partnerships in public sector education and ancillary programmes. However, owing to a lack of government planning, donors tend to work to their own agendas with little or no coordination with local government or each other. Owing to the absence of vision; proper curriculum; effective teaching and research institutions; and a lack of coordination between policymakers, education providers and funders, this dismal picture of the education sector in Sindh is unlikely to change. If it continues, it will result in further inequity, poverty and environmental degradation.

Sindh is at the forefront of the communications sector in Pakistan. This sector consists of the

print and electronic (television and cable) media, radio and information technology (IT). Sindh is home to the most influential print media establishments in Pakistan. The largest and most highly circulated English and Urdu language publications are based in Karachi. Unlike the rest of Pakistan, the province has a flourishing regional language print media which holds a near monopoly over circulation in Interior Sindh. The degree of freedom of expression available to the print media today is unprecedented in Pakistan's history. However, within the publishing circle there is a perception that a process of self censorship through administrative pressure exists. Militant, political, social and religious groups also tend to exert pressure on journalists and publishing houses. In recent years, there has been a rise of vigilantism which has been encouraged by a lack of security within the province. The focus of the print media has been on political reportage and this leaves little space for social and environment-related issues although their coverage has been increasing, especially around issues related to large dams, particularly the controversy surrounding the Kalabagh Dam.

Television viewership has increased tremendously in Sindh over the last few years. Pakistan Television has a major station in Karachi that provides coverage to almost the entire province. Satellite dishes and formal and informal cable networks allow access to a variety of regional channels even in the remotest parts of the province. Surveys indicate that television dramas and public service messages have been extremely useful in the shaping of public opinion on social issues. With 24 hour television channels, the appetite for programming is increasing. Nurturing and feeding off this demand, the numbers of independent investors, production houses, and television producers are escalating. However, institutions for training these professionals do not exist and this adversely affects the quality of the programming. Most of the television products are branded since they rely on advertising revenue. Hence, corporate advertisers often dictate programming. As a result, social and environmental issues are not a priority as compared to revenue earning family soaps, sitcoms, and celebrity laden gala shows. Radio, meanwhile, has been a

neglected medium since the advent of television in Pakistan. However, it has received more attention since the liberalisation of policies regarding private ownership of radio stations and the advent of FM in the urban areas. Cinema too has been on a death spiral in the country as a whole and in Sindh in particular. Much of this is due to the official anti-culture policies of the eighties and nineties. Many of Sindh's secondary cities no longer have cinema houses and 107 cinemas throughout the province had been converted into commercial centres or apartment blocks since May 2000.

There are no definite statistics regarding the IT sector in the province. The number of computer literate persons, number of professionals, or even the number of existing software houses is not known. However, internet service is now available in 138 towns and cities in Sindh due to the government's effort to make dial-up networking available. According to the internet service providers, there are 165 companies nationwide that have been issued licences to operate internet services and the majority of them are based in Sindh. Formal sector institutions providing IT education are expensive and have a limited number of seats. As a result, private and informal educational institutions have mushroomed in all the urban areas of Sindh. In addition, there are 235 software development houses of all sizes in Sindh. Almost all of them are in Karachi and Hyderabad. The biggest problem facing the IT sector in Sindh is the lack of availability of quality software engineers and project managers. This is due to the quality of IT education in Sindh and the brain drain which takes away the best talent to more lucrative assignments outside the country. An IT revolution cannot take place without infrastructure such as an uninterrupted electricity supply, an efficient telecommunication system, and stability and continuity in government policy. Unfortunately, all these prerequisites are missing. However, the role of IT especially the internet is being noticed in the development sector.

The Government institutional framework is vital for any development related activity in the province. The Local Government Ordinance, 2001 has been revolutionary; however,

substantial changes in the system are yet to be realised. Under this Ordinance the structure of Local Areas and Local Governments was revamped. Local Areas now consist of Unions, Talukas, Towns, Districts and a City District. The administrative structure, including the Executive and Revenue System, and the Police force has also undergone significant changes.

NGOs are playing an increasing role in governance related issues. As intermediaries they have helped build bridges and established channels of communication and cooperation between communities, governments, development institutions and funding agencies. Through the establishment of Citizen Community Boards, in the Local Government Ordinance 2001, the state has found a constitutional way of including NGOs in local governance and as partners in development. Internationally too there has been a growing recognition of NGO efforts evident from the shift in donor policies. However, there is an absence of a comprehensive database listing of NGOs and especially CBOs that exist in thousands in the province.

There is a major difference between NGOs working in urban and rural Sindh. Urban NGOs are initiating policy changes through advocacy and by developing models of service delivery through community participation. Rural NGOs on the other hand are primarily involved in service provision. Both urban and rural NGOs have brought about awareness in society regarding the rights of citizens, the need for transparency and accountability, and problems of development related concepts and programmes. However, the government-NGO relationship has not yet evolved to one of trust and interdependence. NGO recommendations for public hearings around government policies and projects have not yet been formalised. The Sindhi press has promoted environmental issues in a big way and as a result a close liaison has developed between the media and NGOs and CBOs. NGOs also produce a large volume of literature in the form of monographs, books, journals and newsletters, regarding their concerns on debt, WTO, government and global economic policies, environment and human rights. This has created further awareness among activists, academia and CBO members and

encourages more writers to delve into these subjects.

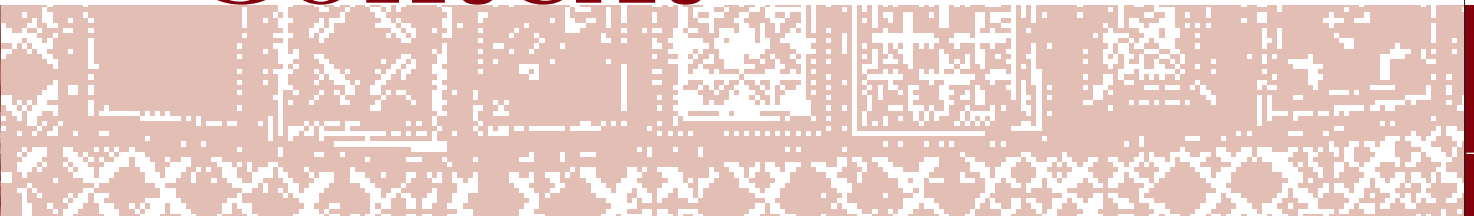
Over the years, the NGO sector has shifted from its purely altruistic nature to a donor driven business. Many NGOs have large budgets and depend on erratic and whimsical donor funding. In addition, skilled personnel for community mobilisation, technical expertise, documentation and monitoring for operating NGO programmes are not easily available. There is a

lack of effective and affordable training institutions for NGO staff, community leaders and activists. Individual NGOs cannot be as effective as NGO networks. A number of such collaborations have been established in Sindh which include the Sindh NGO Federation (SINGOF) and SINDHNET at the provincial level whereas Peoples Voice and the Water and Sanitation Network have emerged from and operate within Karachi.



PART I

The Context





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CHAPTER 1

Introduction



UCN seeks to influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable.

BACKGROUND

In Pakistan, IUCN seeks to fulfil this mission by empowering communities to participate in the implementation of the National Conservation Strategy (NCS). In March 1992, the Cabinet of the Government of Pakistan adopted the NCS, which addresses the issues of conservation and sustainable use of natural resources for economic development. IUCN Pakistan supported the Federal Government in the process of its development. Similar support was provided to the Governments of NWFP, Balochistan and the Northern Areas for the development of relevant provincial level strategies. IUCN's Sindh Programme was established in 2002 to consolidate IUCN's ongoing activities in Sindh and to undertake new initiatives in the Province.

While Sindh is a province rich in natural resources, there has been a dearth of information regarding the environment and development situation of Sindh. Keeping this in view, IUCN Sindh Programme as a first step initiated the process of developing a report on the *State of Environment and Development of Sindh (SoED)* to bridge the existing information gap and to cater to the needs of a wide range of stakeholders, who have been striving for the sustainable development of Sindh. This report is also envisaged to serve as a baseline for policy makers, planners, and development practitioners. While similar documents have been made for other provinces such as NWFP, this is the first document of its kind in Sindh, which attempts to highlight the status and causes of the environmental and development issues inherent here.

Prior to the development of the SoED, 22 sector papers were commissioned from experts in relevant fields. They were required to collate information on their particular sectors, which would ultimately feed into the final SoED. (Refer to **Appendix - 1.1: List of Contributors**) The sectors were identified after the review of existing literature such as environmental profiles of other provinces. While determining the sectors, high consideration was also given to the particular ecological regions of Sindh. The papers are based on a review of published and unpublished documents and the knowledge

and expertise of the author(s) in the subject area. No primary data collection has been involved.

The first draft of each sector paper was then presented at consultative workshops to key stakeholders and other experts in the field, to allow wider stakeholder participation and ownership. The author of each paper made a presentation before the stakeholders and incorporated the recommendations generated at the workshop. For details, refer to **Appendix - 1.2: List of Participants**.

The workshops encouraged dialogue between key stakeholders and raised many issues pertaining to the areas highlighted. In addition, the issues of a specific sector were emphasised through the subsequent media coverage of each workshop, which resulted not only in awareness-raising but also influencing issues at the policy level. Linkages were also formed with a number of stakeholders including public and private sector, academia, civil society, member organisations and the media.

The next logical step to the SoED is to develop a Sustainable Development Strategy for Sindh. The SoED is intended to provide the basis for devising this Strategy, which aims to provide an overall framework to address the Province's environmental and development issues in a holistic manner.

In Sarhad and Balochistan, Provincial Conservation Strategies were formed by IUCNP on the request of respective provincial governments. In both the provinces, the P&DD was the focal department for the development of the strategy. In this regard, dialogue has been initiated with the Planning and Development Department, Government of Sindh, and the process of strategy development is now underway.

SINDH IN THE NATIONAL CONTEXT

Sindh, Pakistan's second largest province plays an important role in the national economic and development agenda. The country's largest city, Karachi, which also houses both its ports, is

located here. The province contains 23 percent of Pakistan's population and 17.7 percent of its land area. With 48.9 percent, it has the highest concentration of urban population as opposed to an overall average of 32.5 percent, making it the most urbanised province in the country. Sindh is also a cultural melting pot, where migrants from other provinces have settled in search of opportunities, and have brought along their own traditions and languages.

Although, the province contains only 23 percent of Pakistan's population, its contribution to Pakistan's economy is comparatively higher than the other larger provinces. Sindh collects 70 percent of Pakistan's income tax and 62 percent of sales tax. Almost 70 percent of the national revenues forming the divisible pool are collected from Sindh, but its share in revenue transfer is only 23.28 percent¹. In the following chapters that deal with various aspects of Sindh's development and environment, a number of other facts emerge. These are given below.

- Sindh contains 54 percent of the country's textile units, 45 percent of its sugar mills, 20 percent of pulp and paper mills, 34 percent of total industrial capacity in large scale manufacturing and 25 percent in small scale manufacturing. In addition, the province produces 35 percent of all manufactured edible oil in the country.
- Around 60 percent of the country's oil fields and 44 percent gas fields are located in Sindh. In addition, 56 percent oil and 37 percent of Pakistan's daily gas production is from Sindh.
- In the agricultural sector, Sindh is a major producer. Around 14 percent wheat, 43 percent rice, 30 percent sugar cane, 25 percent cotton and 30 to 50 percent vegetable crops grown in Pakistan are from Sindh.
- Its coastline of approximately 350 km is also a very productive resource as 48 percent of fish export from Pakistan is from Sindh. Moreover, 71 percent of marine fish resources, 65 percent of fresh water fish resources, and 100 percent of brackish water fish resources are located in Sindh.

- In the context of livestock, 28 percent buffalos, 27 percent cattle, 24 percent sheep, 28 percent camels and 40 percent poultry in Pakistan is found in Sindh.
- Six of the major wetlands in the country are located in Sindh. Another three important wetlands have also been added to them recently. The province also contains the only substantial large scale mangrove forests in the country.

Karachi is the capital of the province and is one of the primary cosmopolitan cities of Pakistan. It contains 62 percent of the total urban population of the province, approximately 25 percent of the total urban population, and about 9 percent of the total population of the country. Due to the strategic geographical placement of Karachi, a number of federal agencies control the development and environment related affairs of the city and hence of the Province as well. These include the Karachi Port Trust, Military Lands and Cantonment Boards, Pakistan Railways, Pakistan Steel Mills, Port Qasim Authority, Civil Aviation Authority and Customs.

Sindh depends on its northern hinterland for its most important resource - water. The Indus is the only perennial water source for the province. The low availability of its water has had an adverse effect on every aspect of development and conservation. This includes the destruction of the Indus Delta region, stress on its wetlands and forests, reduction in its agricultural produce, problems of potable water supply in its rural and urban areas and the endangering of its rich flora and fauna. Therefore, one of the major issues in Sindh is the water crisis that is gradually increasing. This phenomenon is highlighted in almost all the chapters in this profile.

INSTITUTIONAL FRAMEWORK OF SINDH

The Government of Sindh (GOS) is divided into the Provincial Government and the Local

1 Shaikh, Imtiaz "Making NFC Award Fair" Dawn, 31 May 2002

Government, which includes the City District Government.

The Provincial Government of Sindh has a Governor, a Cabinet of Ministers headed by a Chief Minister and a Provincial Assembly. Although there is a well-defined division of responsibilities between Federal and Provincial governments, there are some functions on which both can construct laws and establish departments for their execution. The parliament and a provincial assembly have the power to make laws with respect to any matter in the Concurrent Legislative List of the Fourth Schedule to the Constitution.

According to the Sindh Local Government Ordinance, 2001, the Local Government of Sindh is to work within the Provincial framework and adhere to Provincial and Federal laws. In the performance of their functions, the Local Government shall not impede or prejudice the exercise of the executive authority of the Government.

The Provincial Government

The executive authority of the Province lies with the Governor and shall be exercised by him, either directly or through officers subordinate to him, in accordance with the Constitution. The Federal Government nominates the Governor of the province. All executive actions of the Provincial Government are to be taken under the aegis of the Governor. He is responsible for appointing important functionaries and lays down the rules for the allocation and transaction of the business of the Provincial Government.

The Sindh government comprises of a Cabinet of Ministers, with the Chief Minister at its head to aid and advise the Governor. The Governor appoints a Chief Minister from amongst the members of the Provincial Assembly who in his opinion is likely to command the confidence of the majority of the members of the Provincial Assembly. The Cabinet is collectively responsible to the Provincial Assembly.

According to Article 131 of the Constitution, it should be the duty of the Chief Minister

- (a) to communicate to the Governor all decisions of the Cabinet relating to the Administration of the affairs of the Province and proposals for legislation.
- (b) to furnish such information relating to the administration of the affairs of the province and proposals for legislation as the Governor may call for.
- (c) to submit to the cabinet any matter on which the decision has been taken by the Chief Minister or a Minister but which has not been approved by the Cabinet, if the Governor requires.

Members of the Provincial Assemblies are elected by universal adult suffrage. Seats are also reserved for minorities. On the recommendation of the Provincial Government, the Assembly may, by law, confer functions upon officers or authorities subordinate to the Provincial Government. Subject to clauses (7) and (8) of Article 130 of the Constitution of Pakistan, the Governor shall appoint the Provincial Ministers from amongst members of

Box 1.1: Organisation of the Sindh Governor House

The Governor House functions under two wings:

1. Military Secretary's Wing, headed by **Military Secretary** (serving officer of Pakistan's Armed forces). Under the Military Secretary there is an ADC (also a serving officer of Armed Forces, a comptroller and Section Officer General).
2. Governor's Secretariat, headed by **Principal Secretary to Governor**.

Additional Secretaries, Deputy Secretaries and Section Officers assist the Principal Secretary.

Press Secretary to the Governor looks after the Media related matters and keeps liaison between the Press and Governor House.

the Provincial Assembly on the advice of the Chief Minister.

The Governor shall appoint a person to be appointed a Judge of the High Court to be the Advocate General of the High Court. The Advocate General is to advise the Provincial Government upon such legal matters and perform such other duties of legal character as may be referred or assigned to him by the Provincial Government.²

The administrative set up of the Province of Sindh consists of:

1. The Executive and Revenue System,
2. The Judiciary and
3. The Police Department

The functions and organizational structure of each, as highlighted in the Sindh Local Government Ordinance, 2001, are described below:

The Executive and Revenue System

The province of Sindh is divided into districts. There are currently 16 districts in Sindh.

The Chief Secretary who is assisted by Additional Chief Secretaries is in charge of the command center of the Government of Sindh, located in Karachi. Secretaries of various departments oversee the smooth functioning of their particular units. For details refer to **Appendix - 1.3: Provincial Departments of Sindh**. The District Coordination Officers (DCO) in the districts serve as focal points for administrative purposes to steer, coordinate and regulate the performance of different government departments, at the district level.

Talukas coordinate the social, economic and political activities of the villages. Duly elected presidents of a certain number of villages form a Taluka. Generally one sub-division comprises one Taluka, however, in some cases; it may include two or more. Each Taluka is divided into Supervisory Tapedar Circle (STC), which are further split into Tapedar Circles (TCs). These are decompounded to Dehs (revenue estates). These tiers are supervised by respective revenue officials.

Judiciary

The apex Court of the country is the Supreme Court of Pakistan, and the highest Court of the Province is the High Court of Sindh. The High Court of Sindh has a principal seat in Karachi, a permanent bench in Sukkur, and circuit Courts in Hyderabad and Larkana. It is presided over by the Chief Justice of Sindh and has 28 judges altogether. At each bench or circuit 2-3 judges of the High Court conduct hearings of cases.

The subordinate judiciary consists of 20 District Courts, 1 Small Causes Court in Karachi and 9 Anti-Terrorist Courts. Approximately 406 judges work in the subordinate courts as District and Sessions Judges, Additional District and Sessions Judges, Senior Civil Judges, Assistant Sessions Judges, Civil Judges and Judicial Magistrates. There are about 4000 staff members who work in the subordinate courts excluding the judges.

Besides this tribunals such as Environmental Tribunals and Services Tribunals, have been established by the Federal and Provincial Governments at the federal and provincial levels, respectively. Furthermore, there are Banking Courts, Labour Courts, and Anti-Corruption Courts which deal exclusively in their respective areas.

Environmental Tribunals are presided over by a Chairperson who has been qualified to be a Judge of the High Court. The Chairperson is selected upon the recommendation of the Chief Justice of the High Court. Out of the two other members appointed, at least one must be an expert in the environment field. The environmental tribunal shall exercise such powers and perform functions that are assigned to it under the Pakistan Environmental Protection Act of 1997. Decisions taken are based upon majority opinion.

A judicial magistrate of the first class is appointed as an Environmental Magistrate empowered by the High Court to impose punishments that are specified in sub-section (2) and (4) of section 17 in the Act of 1997. On May 15, 1999 the first Judicial Magistrate of each district was posted at the Headquarters in Sindh.

Police Department

With its headquarters in Karachi, the Inspector General (I.G.) administers the Police Department. The police department is supposed to maintain law and order. The para military forces such as the Rangers also offer assistance to the police to reach their goals, whenever required.

According to the Police Order 2002, Article 2 (xii) and Article (xxv) the structure of the Police force is as follows:

Senior Police Ranks

1. Inspector General
2. Additional Inspector General
3. Deputy Inspector General
4. Assistant Inspector General / Senior Superintendent
5. Superintendent
6. Assistant Superintendent / Deputy Superintendent

Junior Police Ranks

1. Inspector
2. Sub-Inspector
3. Assistant Sub-Inspector
4. Head Constable
5. Constable

According to this new order of 2002 the provincial government shall post a police officer

of the rank of Inspector General as a Provincial Police Officer of the province. Article 11(1)

The provincial government in the case of capital city district shall post a police officer of the rank of Additional Inspector General as Capital City Police Officer. Article 11 (2)

The Provincial Police Officer may post a City Police Officer for a city district and District Police Officer in a district in consultation with the provincial government concerned. Article 15(1)

Local Government

A new scheme of local governance was introduced in recent years. The Local Government Ordinances 2001 paved the way for the establishment of a three-tier local government structure.

1. The District Government
2. The Taluka and Town Administration
3. The Union Administration

The District Government: Province of Sindh

The District government consists of the District/ Zilla Nazim and District Administration. The District Government of Sindh has up to thirteen administrative departments, a council and is headed by the Zilla Nazim in Karachi. Under the new system, these administrative units are accountable to elected councils and ultimately to the electorate. The Zilla Nazim assisted by the District Coordination Officer monitors and manages the district administration, which consists of district offices including sub-offices at the Taluka level.

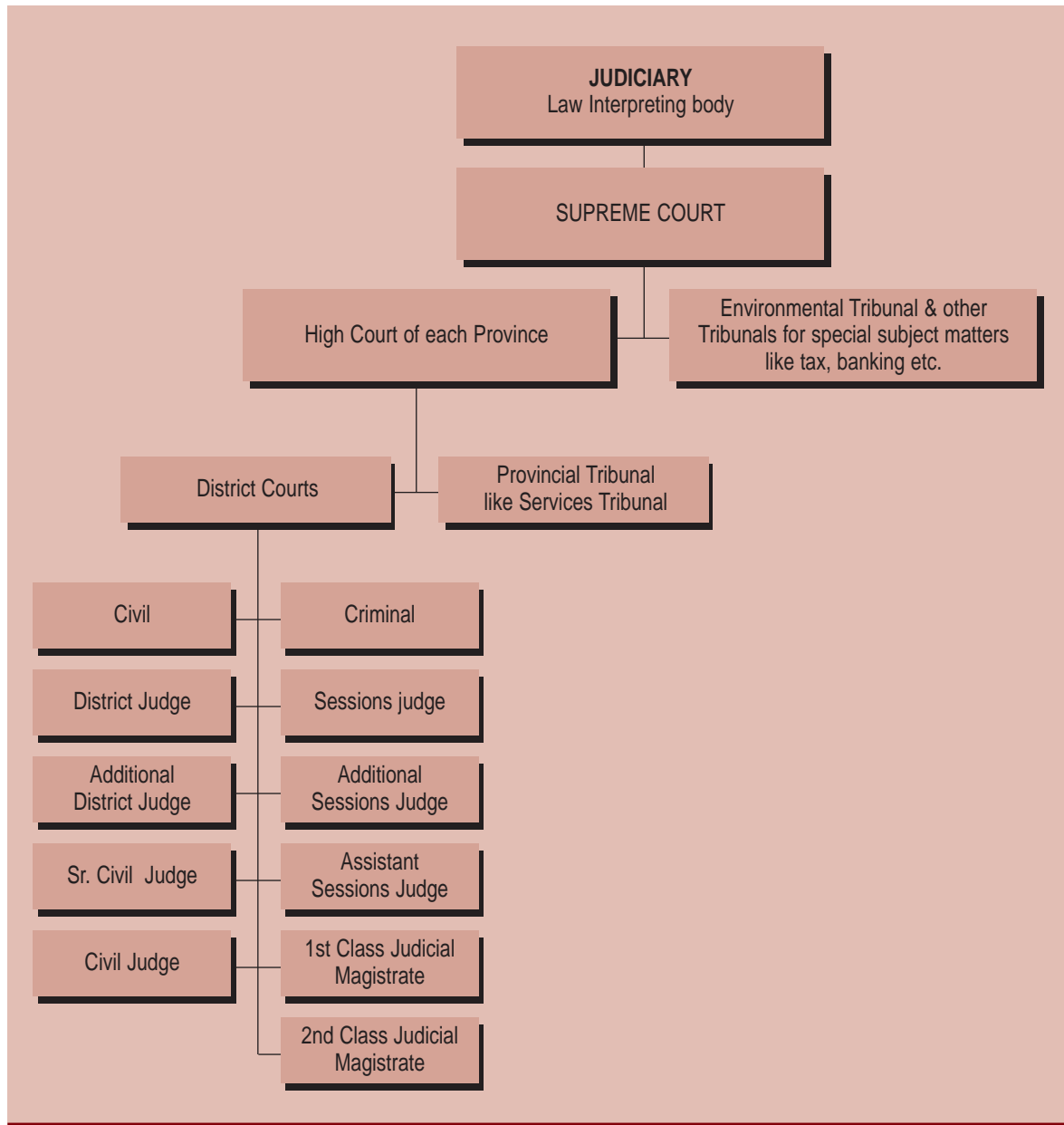
The District Coordination Officer (DCO) was appointed by the Provincial Government and is the coordinating head of the District Administration. In Sindh, Co-ordination, Human Resource Management and Civil Defence is incorporated into the duties of the DCO. Further responsibility for the smooth functioning of each subordinate administrative unit is delegated to the Executive District Officers (EDOs).

Table 1.1: Sindh at a glance

CITY DISTRICT	1
DISTRICTS	15
TALUKA COUNCIL	86
TOWN COUNCILS	18
POLICE STATIONS	358
POLICE POSTS/CHOWKIES	271
UNION COUNCILS	1094

Source: <http://www.sindh.gov.pk>

Organogram of the Judicial System



The Zilla Nazim is accountable to the people through the elected members of the Zilla Council. A Zilla Council consists of all Union Nazims in the District, which include members elected on the reserved seats. These seats are set aside exclusively for women, peasants, workers and minority communities. The Office Establishment of the Zilla Nazim delegates responsibility from the Zilla Nazim to the Administrative Officer who manages the support staff.

The Zilla Council has its Secretariat under the Naib Zilla Nazim with a separate budget allocation. The Council Officer assists the Naib Zilla Nazim. The staff of the Zilla Council includes an Assistant Council Officer, Superintendent and support staff. For a detailed listing, refer to **Appendix 1.4: Details of Zilla Nazims and Naib Zilla Nazims in Sindh**.

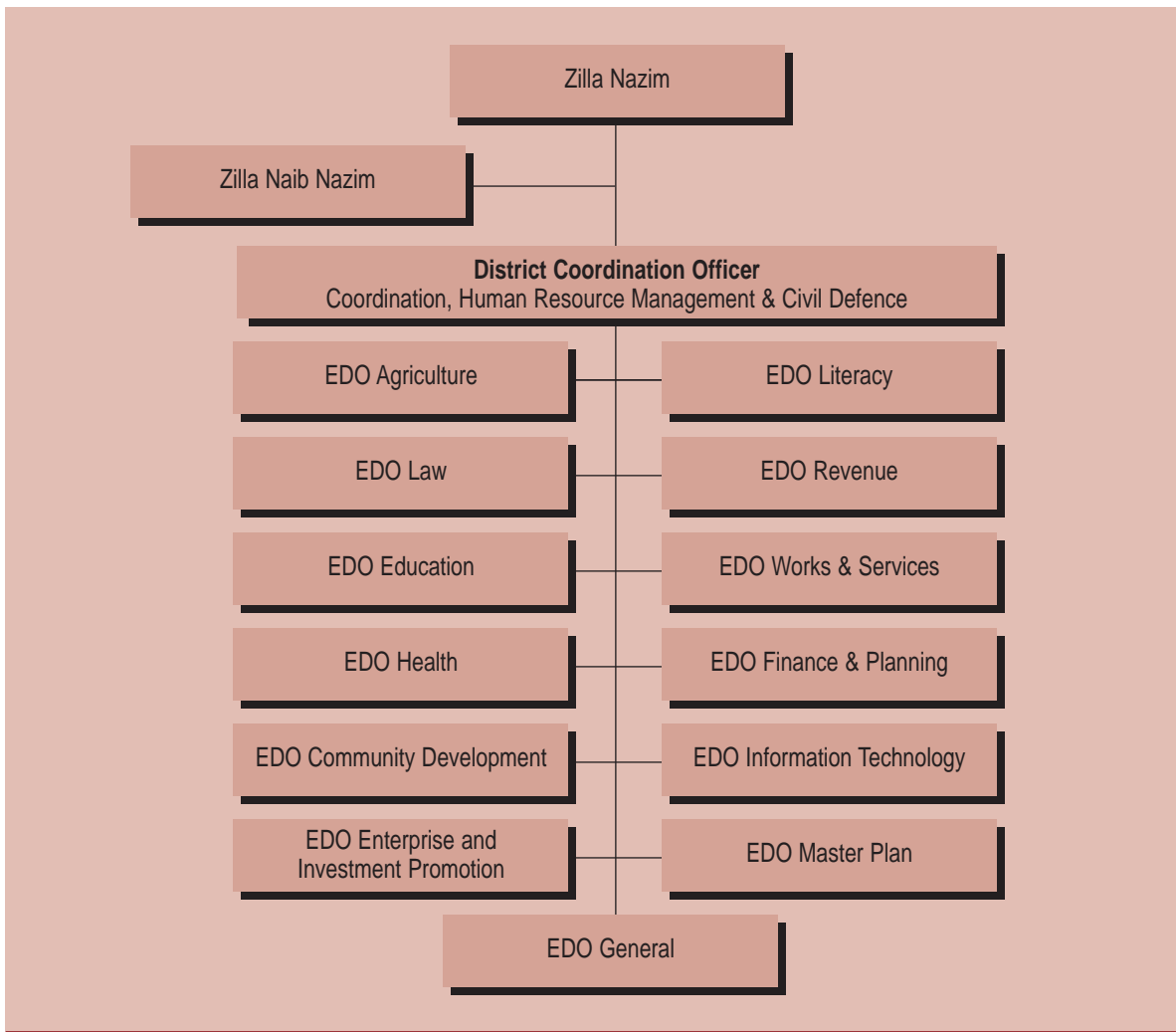
The Provincial Government has established a Public Safety Commission in each district

consisting of 8, 10 or 12 members depending on the area covered by the district and its population. Half of the members are elected by the Zilla Council from amongst its Councillors whilst the other half are independent members appointed by the Governor from a list of names recommended by the District Selection Panel. A Chairperson is elected from one of the members to preside over meetings. The Public Safety Commission facilitates police-public co-operation and acts as a liaison between the District Police Officer and the functionaries from various tiers of the District Government, including the Zilla Nazim by accepting complaints and conducting enquiry whenever required.

The new system of local governance was designed to efficiently address the specific needs and problems of each district. The District Government is responsible to the people and the Provincial Government for improvement of governance and delivery of services. A Zilla Mohtasib redresses citizens' complaints against maladministration of the public office dignitaries (including District Government, Taluka Municipal Administration, Union Administration, Zilla Nazims, Zilla Naib Nazims, District Police Officers and Council Members) in the local governments within the district.

The Zilla Mushavirat Committee consists of the Zilla Nazim, Naib Zilla Nazim, and all Taluka and

Organogram of the District Government



Source: Approved Organograms of Restructured Groups of Offices of a Common District and Approved Establishment of Zilla Nazim and Zilla Council. December 2001. Compiled by Provincial Transition Wing, Local Government Department, Government of Sindh

Town Nazims in the district. The Zilla Nazim is the Chairman of the Zilla Mushavirat Committee whilst the District Coordination Officer acts as the Secretary. It is to meet at least once every three months. As outlined in the Sindh Local Government Ordinance 2001, amongst the functions of this committee are to crystallize vision for integrated development of the district and takulas, to resolve intra-district disputes and muster resources for crisis management.

Citizen Community Boards are set-up in every local area. Groups of non-elected citizens may, through voluntary, proactive and self help initiatives, establish as many of these organisations as they require. The general body of members elects the Chairman, Executive Committee and a Secretary of the Board for carrying out its functions. Community Boards are to provide a vast array of services including the development and management of new or existing public sector facilities; welfare services; establishment of cooperatives; identification of the needs of the local area and the provision of grants and encouraging stakeholder participation for wider community participation.

Taluka and Town Administration

The middle tier, the Taluka is headed by the Taluka Nazim who governs the Taluka Municipal Administration. The hierarchical structure of which includes a Taluka Municipal Officer, Taluka Officers, Chief Officers and other officials of the Local Council Service. The Taluka Municipal Administration is entrusted with the functions of administration, finances, and management of the offices of Local Government and Rural Development, and numerous other subjects at all levels.

In every town in the City District there is a Town Municipal Administration which consists of the

Town Nazim, Town Municipal Officer, Town Officers, Chief Officers and other officials of the Local Council Service and officials of the offices entrusted to the Taluka Municipal Administration³.

Union Administration

The lowest tier, the Union Administration is a corporate body covering the rural as well as urban areas across the whole District. It consists of Union Nazim, Naib Union Nazim, three Union Secretaries and other auxiliary staff. The Union Nazim is the head of the Union Administration and assisted by the Naib Union Nazim. The Union Secretaries coordinate and facilitate community development, functioning of the Union Committees and delivery of municipal services under the supervision of the Union Nazim.

City District Government Karachi

Karachi is the largest metropolitan city in Pakistan, housing a population of approximately 14 million. As a result of the devolution plan, an elected and representative government has been established at the city level which consists of the City Government Secretariat.

18 Town Administrations and 178 Union Council Administrations are set up in Karachi to effectively manage the city.

The City Nazim, Town and Union Council Nazims have been entrusted with the task of providing basic amenities to people living in the area. For details refer to **Appendix 1.5: Listing of Towns and Important City District Functionaries**.

3 The Sindh Local Government Ordinance, 2001. Revised Edition 2003. The Ideal Publishers. Karachi, Pakistan



CHAPTER 2

The Natural Environment



Sindh is located in the south-east of Pakistan. Throughout history it has been known by many names; it was called Sindomana by the Greeks, Sindhudasha by ancient Hindus, Sindh by Arab geographers and Sindhu by the native people.

Physiographically, Sindh comprises of the Lower Indus Basin. It the second-most populous province after the Punjab and covers 140,914 square kilometre (km), with a north-south length of about 540 km and a breadth of about 250 km. It lies between 23° and 28° North latitudes and 66° and 71° East longitudes. The province of Balochistan is on its west and north, and the Punjab is on its north-east. To its east is the Indian state of Rajasthan and Gujarat, and the Arabian Sea is on the south. Map - 2.1 shows the different areas of the Province.

Topographically, Sindh can be divided into four distinct parts with the dry and barren Kirthar Range in the west, a central alluvial plain bisected by the River Indus, a desert belt in the east, and the Indus delta in the south.

Except for a small hilly tract (Nagarparkar), in the southeast corner of the Tharparkar District, western Sindh is the only region which is mountainous and includes the hill ranges of Kirthar, Pab, Laki, and Kohistan. There is no vegetation on these ranges due to scanty rainfall. The highest altitude known as Kutai-ji-Kabar (Dog's Grave) is in the Kirthar Range and is 2072.64 meters high. These ranges run north to south like a crescent turned towards the low lands and extend up to the northern extremity of the province. Kirthar has a simple, anticlinal structure with flanks gently dipping towards west and south. The Laki Range, on the other hand, is mainly composed of tertiary rocks and contains a large number of thermal springs. Map 2.2 shows the geology of Sindh.

A large part of Sindh lies in the deltaic plain of the Lower Indus Valley. Most of this region consists of plains overlain by alluvium, trenched with river channels in some places and overridden by raised terraces in others. A few isolated low limestone hills are the only relieving features in the plains which are otherwise at one level.

The plains may be subdivided into three parts: the western valley, the eastern valley, and the deltaic area. The western valley section is distinguished from the eastern valley by the presence of old alluvium and seasonal *nala* flowing from the Kirthar mountain range into the Manchar Lake.

The deltaic area largely consists of mangrove swamps and sandbars. The chief characteristic of the region is the creeks, which serve as the changing outlets of the Indus and as inlets for the sea. The lowland Indus plain merges into this region.

The eastern part of Sindh consists of the Thar Desert which continues into Rajputana (India). The landscape is sandy and rough with sand dunes covering more than 56 percent of the area. The relief in the area varies between near sea level to more than 150 metres above sea level. The sand dunes are mostly longitudinal with a north-east-south-west trend and are stabilized by shrub vegetation and grass.

Geology¹

As mentioned before, a considerable part of Sindh is a plain, occupied either by recent alluvium or wind-borne sand. The principal features of geological interest are to be found in the hilly portions of the province, towards the west of the Indus. Outlying extensions of this hilly tract occur east of the Indus, near Sukkur, Hyderabad, and Jerruck. The isolated hills of Nagarparkar on the northern border of the Rann of Kutch belong to quite a different system both geographically and geologically.

The hilly region of western Sindh consists almost entirely of rocks belonging to the tertiary system of geological nomenclature. It is only along the Laki Range and in its neighbourhood that there are some exposures of rocks belonging to the next older system, the Cretaceous. With the exception of some volcanic beds associated with these Cretaceous strata, all the rock formations of western Sindh are of sedimentary origin. All of the more important hill masses consist of limestone. A great majority of these limestone deposits belong to the Nummulitic period and are largely built up of the accumulated shells of foraminifera, principally those belonging to the genus Nummulites.

In fact, nearly all the conspicuous hills consist of massive nummulitic limestone, though not all of them belong to the same period and are also of

1. Aitken, E.H. Gazetteer of the Province of Sindh. Indus Publication, Karachi



Vegetation surrounding Karoonjhar Hills in Nagarparkar, Thar

different species. The Kirthar Range contains the newest strata, while the Laki Range and hills in Thatta and Hyderabad contain the oldest. It is these specific differences amongst fossil contents of these massive limestones that have enabled geologists to recognize that different exposures do not strictly belong to the same age. However, there are many similarities like the massiveness, the nodular structure and a close-grained, compact texture, pale colours - - pale grey, pale buff or white -- and at times, the presence of flint masses. Although belonging to different periods, these are subdivisions of one great geological group, termed by geologists as the 'Kirthar Group', which corresponds to the Luteian of European nomenclature.

The rocks resting upon the Kirthar limestone in the hollow troughs, or synclines that intervene between these anticlinal ridges are soft shale and sandstone that have been eroded from the roofs of the anticlines. The underlying Kirthar limestone however, resists disintegration. Due to this factor, these arched or dome shaped ridges present a whale-back appearance. The drainage of these limestone hills collects in deep narrow gorges with precipitous sides that form rifts across the ranges.

Besides these, there are important accumulations of other rocks such as shale and clay and especially sandstones. Beds of shale or clay occur along the western base of the hills south of Rohri, at Dharan Lak (in the Laki Range), and near Hyderabad, Jerruck and Thatta. These softer beds contain beautifully preserved fossil which cannot be extracted and only weather out as unrecognizable casts. The rich fossil fauna include foraminifera (chiefly nummulites and alveolines), and numerous species of corals, echinoids and molluscs.

Furthermore, there are three important outcrops of rocks that are older than the Kirthar group. These consist of rocks of the tertiary age and are situated to the northwest of Kotri and in the neighbourhood of Jerruck. They represent a geological division known in Sindh as the Ranikot group, named after the Ranikot Fort located in the Laki Range.

The third exposure situated along the Laki Range is also characterized by the Ranikot beds. Underlying these are some strata of the cretaceous age, which are the oldest of those exposed in western Sindh. The Laki Range is a steep anticline whose symmetry has been

disturbed by faulting. Consequently, the western section has been raised to the extent that a considerable depth of strata underlying the Kirthar limestone has been exposed. The lowermost beds at the Barrah Hill consist of hard calcareous sandstone and fairly massive limestone containing Hippurites, a characteristic cretaceous fossil shell. These are overlaid by a substantial layer of sandstone of variable colour, whose outer surface weathers deep black when exposed to the atmosphere. This sandstone is exposed at various places along the Laki Range from Jhakmari to Ranikot and forms black coloured hills.

The Ranikot and Kirthar groups both belong to the lower division of the tertiary system that is known as the Eocene in geological nomenclature. The next two divisions, the Oligocene and the Miocene, are represented in Sindh by a vast accumulation of strata consisting principally of sandstone. These, owing to their friability and easy denudation, do not form any conspicuous orographical features despite their considerable thickness. The lower one, of the Oligocene age, is called the Nari group, while the upper is named the Manchar group and is mostly Miocene. The grey Nari sandstone is largely

marine in origin and abounds in fossils. The lower limestone does not influence the topography since it rests on the massive limestone of the Kirthar group. However the uppermost limestone, known as the Gaj beds (due to its being well exposed in the Gaj River valley east of the Kirthar Range) has withstood denudation far better than the two great masses of sandstone with which it is intercalated. It contains corals, echinoids and mollusks. The Manchar beds are mostly unfossiliferous, though their lower strata sometimes contain detached teeth and bones of large mammalia such as Dinotherium, Mastodon and Rhinoceros. These sandstones frequently also contain numerous silicified tree trunks.

The isolated hill mass of Nagarparkar on the northern edge of Rann of Kutch belongs to an altogether different geological series. It is composed of granite of the Aravalli Range that belongs to the Archaean system and constitutes the oldest rocks of the earth's crust.

Hydrology

Sindh is entirely dependent on the River Indus for its survival and development. Almost 20



Sindh Wild Life Department

A view of Kirthar National Park

years' data (from 1980-81 to 1997-98) demonstrates that about 95 percent of the farmland in Sindh obtains its water from the irrigation system, while the rest is cultivated with the help of tube wells².

The limited groundwater (less than 5 MAF) in the province is available in only 28 percent of the entire area. Rainfall is only in the range of 100 to 200 mm per annum, while the evaporation rate is about 1000 to 2000 mm, depending on climatic conditions. Thus the whole of Sindh is arid, with the River Indus being the primary freshwater source that gives life to the province.

With population growth, the average amount of renewable freshwater available to each person declines. A country is considered to be under serious water stress if it falls below 2000 cubic meters. It is classified as water deficient if the per capita water availability falls under 1000 cubic meters. In such a situation the socio-economic and environmental development of the country is seriously hampered. These issues are further discussed in Chapter 4 (Water Resources).

The per capita water availability in Pakistan was 5000 cubic meters in 1947. This had declined to about 1200 cubic meters in 2002. In Sindh it falls below the national average, indicating that the province has entered a phase of water insecurity. This calls for providing it with its legitimate share of water from the Indus River System and taking all possible measures to conserve and manage water, ensuring the continuity of life and economic development.

Soil

The soil in the plains of Sindh is plastic clay that has been deposited by the Indus. Combined with water it develops into a rich mould and without water it degenerates into a desert. Nearly the entire Indus valley has soil which is extremely friable and easily disintegrated by the flow of water. Resultantly, the water always contains a large amount of suspended silt. Map-2.3 show the locations of different types of soils in Sindh.



Tahir Qureshi

Fruit Orchard in Coastal Area

Vegetation

Information available on the ecological distribution of vegetation in Sindh, which deals with the quantitative aspect of floristic composition of the region, is sketchy and outdated. However, the vegetation of Sindh has certain characteristic features³ indicative of a rainless climate, dry atmosphere and sandy soil largely impregnated with salt. The most striking characteristic is the predominance of plants with small leaves, or none at all, like the leafless caper, milkbush and the cactus (*Euphorbia nereifolia*). The large leaved Banyan tree, like the *pipal*, was introduced later. Another feature of the vegetation in the province is the prominence and variety of grasses.

Except for the irrigated Indus valley, the province is arid and with little vegetation. The dwarf palms, *Kher* (*Acacia rupestris*), and *Lohirro* (*Tecoma undulata*) trees are typical of the western hill region. In the central valley, the *babul* (known as *Babur* in Sindhi) tree is the most dominant and occurs in thick forests along

2. Government of Pakistan 2000

3. Aitken, E.H. *Gazetteer of the Province of Sindh*. Indus Publication, Karachi

Table 2.1: Land use in Sindh

	Land Use	(In million HA)	
		Area	Percentage
i	Net Sown	3.022	21.446
ii	Current fallow	1.439	18.935
iii	Cultivable waste	2.688	10.212
iv	Total available for cultivation	7.149	50.593
v	Not available for cultivation	5.830	41.374
vi	Forest	1.125	7.984
vii	Unreported	0.007	0.049
Total		14.091	100.00

Source: 25 years of Sindh in statistics GOS, 1998 and SFD records

the Indus banks. The *neem* (*Azadirachta indica*), *ber* (*Zizyphus vulgaris*) or jobba, *lai* (*Tamarix orientalis*) and *kirirr* (*Capparis decidua*) are among the more common vegetation types. Mango, date palms, and the more recently introduced banana, guava, orange and *chiku* are the common fruit-bearing trees of the irrigated areas. The coastal strip and the creeks abound in semi-aquatic and aquatic plants and the in-shore Indus deltaic islands support forests of timmer (*Avicennia marina*) and *chaunir* (*Cerriops tagal*) trees. Water lilies grow in abundance in the numerous lakes and ponds, particularly in the Lower Sindh region. For more details, see Chapter 9 (Forestry) and 12 (Flora). Map 2.4 shows the vegetation spread in Sindh.

Land-Use

Agriculture, followed by forestry, is the main land use in the central alluvial plain. Although more than 50 percent of the total geographical area is cultivable, only 26 percent of it is actually located in the central plain. The land inside the Indus embankments is almost equally employed by agriculture and forestry, while that outside the embankments is more extensively utilised for agriculture in the form of sparsely distributed irrigated plantations. Land use in Sindh is given in table 2.1 and is shown in Map 2.5.

Climate

The climate of Sindh varies with geographical location and is further influenced by the province's physical features. The daily range of

temperatures is variable with the minimum range being in the coastal region.

The highest average humidity (75 percent) occurs in August, and the lowest in December in lower Sindh (58 percent) and in April in upper Sindh (47 percent). Thus the weather is drier and hotter in the north than in the south. The skies are generally clear and frost is not uncommon. While in upper Sindh it is generally calm for almost half of the year, the wind velocity in the coastal areas is about 24 km per hour during the monsoon season. Dust storms and squally weather are common at the beginning of the two cropping seasons (*Rabi* and *Kharif*). The predominant wind direction in Karachi is westerly before the monsoon season begins, while in winter the direction is northeast or northwest. In upper Sindh, it varies from southeast to northeast in summer and from northeast to northwest in winter.

Rainfall in Sindh is scanty and, due to the orography of the province, also very variable. Sindh lies between two monsoon zones (southwest and northeast). It misses the influence of the southwest monsoons, while the northeast monsoons do not extend much beyond the Ganges Basin. The mountains on the west of Sindh are not high enough to catch the southwest monsoon current in one part of the year and to prevent the cold blasts from the Iranian plateau from entering the region in the other. Map 2.6 shows the mean annual rainfall in different parts of Sindh.

The climatic conditions of Sindh differ in the upper, middle and lower regions. In upper Sindh

dry atmospheric conditions prevail due to the orographical features of the North West Frontier Province (NWFP). Rainfall is lowest and the temperatures highest in this part of the province. The winter daily temperature range is wide and frost is common. The climate resembles the continental type.

In middle Sindh the south-west monsoon winds blow with an average speed of 18 km/hr in June and the rainfall is occasionally slightly higher than in Karachi. The temperatures are lower here than in upper Sindh and humidity is moderate. The range of temperatures is also much narrower than in the upper part of the

province. Dry hot days and cool nights in summer are characteristic of this region.

The winding coastline in lower Sindh affects the climate of the area to some extent. The coastal and deltaic regions are naturally damper, with smaller ranges of temperature and pressure. The prevailing air currents are the southwest winds in summer and northeast winds in winter. Rainfall at times is a little lower here than in middle Sindh. Humidity is the greatest and the temperatures moderate throughout the year. High humidity causes muggy or oppressive weather in summer and the climate is classified as maritime.



CHAPTER 3

The Human Factor



A

s compared to the other provinces, Sindh houses the largest percentage of urban population in Pakistan; almost half of its population, about 30 million people, live in urban areas.

HISTORY

Sindhi is the mother tongue of about 60 percent of the population of the province. The other major languages spoken here are Urdu (21.05 percent) and Punjabi (7 percent). However, where language is concerned, there exists a rural-urban divide. Sindhi is the mother tongue of over 92 percent of the rural population while Urdu is the mother tongue of about 50 percent of the urban population. This division is unique to Sindh for in the other provinces of Pakistan, the regional language dominates both the rural and urban areas (for details see Table 1- Languages Spoken- Pakistan/Provinces in **Appendix - 3.1- Socio-economic Data Sindh**).

Language and Race

The Sindhi, Balochi and Brahvi speaking people are the earlier residents of Sindh. They are the descendents of various races that have invaded and/or settled in the province since the



Muhammad Ali Qadri

Thari style of turban

beginning of history. Though the original Indus Valley Civilization race intermingled with others through centuries of migration, some anthropologists claim that the Mohanas of Manchar Lake and certain tribes of the western hills (such as the Bukak and Ghaencha), exhibit characteristics of the pre-Aryan population of the Indus Valley¹.

The Aryan invasion of India took place between 1500 - 1000 BC. After the invaders settled in Sindh, they segregated into three major groups: the Brahamin, who were the priests; the Jat (Samat in Sindh), who were the agriculturalists; and the Gujjar who were herders. The ruling and warrior class, the Rajputs, later evolved from the Samat. Major invasions of India from Central Asia and Eastern Europe took place during the period of 200 BC - 200 AD and the invaders assimilated into the already existing Aryan caste and clan system. Thus, the Saka, the Hun, the Pahlava and the Kushan are the ancestors of the great majority of modern Sindhis².

The settlement of Arabs in Sindh began with the Muslim conquest in 8 AD. A number of Sindhi tribes including the Syed, Siddiqui, Farooqui, Usmani, Panhwar, Manghi, Bijjar and the Baloch, claim to be of Arab descent. The Baloch tribe started moving into Sindh in 15 AD. They claim to be of Syrian stock and were given land by the rulers of Multan (which was then a part of Sindh) in return for rendering military services. In the same period, Central Asian military officers and soldiers associated with the Arghun and Tarkhan dynasties settled in Sindh. During the rule of the Durrani dynasty in the eighteenth century, the Pathan settled in Ghari Yasin and Shikarpur. Jat tribes from the Punjab such as the Sial, Jjoyo and Khuhkwar also settled in Sindh during the same period.

Among the Hindus, there are the Samat and Rajput clans such as the Chachar. The Lohanas, who now constitute the great majority of Hindu Banya in Sindh, are also believed to be of Samat origin. The Khoja and the Memon, who like the Lohana are engaged in trade and business, are supposed to be the Lohana who converted to Islam. The people settled in the

1 Lambrick, H.T. 1975. Sindh: A General Introduction. Sindhi Adabi Board, Hyderabad

2 Ibid



Storage of grains

Thar area include an artisanal caste called Menghwar, and the Kohli and Bhil clans that migrated in more recent times from Rajputana and Gujrat. They are considered a "low caste" in the Hindu system and are untouchables.

The majority of Urdu, Punjabi and Pushto speakers migrated to Sindh after the partition of the sub-continent. As is evident from Table 1 in **Appendix 3.1**, they are almost entirely urban dwellers. As such, there is a major difference between their sociology and that of the rural population. This is discussed later in the text.

The Sindhi Language

The Sindhi language is one of the Landha group of the outer circle of the Indo-Aryan languages that belong to the north-western parts of South Asia. It has a strong connection with the Dardic languages of the north of Pakistan, especially Kashmiri. Like other languages of Aryan origin in South Asia, it is derived from a Prakrit, which is an earlier popular dialect of Sanskrit. However, in the case of Sindh, it is unique in its retention of a number of characteristics of the

earlier Prakrit that have been lost in other Indo-Aryan vernaculars. This is largely due to the isolated position of Sindh, separated by the desert from other areas where cognate languages are spoken. Standard Sindhi, the literary language, is spoken in the central areas of the province. In addition, there are five dialects of Sindhi: *Siraiki*, spoken in upper Sindh and *Kachhi*; *Thareli* or *Dhatki*, in the eastern desert areas; *Lari* in the delta of the Indus and the coastal areas; *Kachchhi*, in the peninsula of Kutch; and *Lasi*, near Karachi and in the south of Las Bela³.

After the Muslim conquest, the Sindhi language acquired a considerable vocabulary, as well as concepts and literary forms, from Arabic, Persian and Turkish. Earlier, it was written in Devnagri characters by the Hindu Bania. The present script, derived from the Arabic, was introduced by the British in the nineteenth century.

Settlement Patterns

There are major differences in the settlement patterns of the rural and urban areas. Rural

areas in Sindh consist primarily of small villages built around a clan or an extended family. Even where the population of a village is multi-clan, the village is divided clan-wise into neighbourhoods or *para*. With the development of a cash economy and the prerequisites of adopting green revolution technologies, the villages on the major communication corridors are changing in social and economic terms to become multi-clan and multi-class settlements. Previously, towns were also divided clan-wise into neighbourhoods or *mohalla* such as Usmani *Mohallah*, Manghi *Mohalla* etc. However, with the arrival of the refugees from India, the *mohallas* vacated by the fleeing Hindus and Sikhs became non-clan in nature. This was a major social revolution for the urban settlements of Sindh since local neighbourhood level organizations ceased to exist in many areas.

The rapid increase in urban population and the failure of the state to build social housing, has created a major demand-supply gap in housing. As a result, more than 50 percent of the urban population of Sindh lives in informal settlements or *katchi abadis*. These settlements are unserviced or under-serviced and as such their residents organise themselves to struggle for the acquisition of basic urban services either through self-help or through negotiations with state authorities. Their activists are also emerging as their new local leaders. These settlements, like the planned areas of the city, are for the most part multi-ethnic, although Pathan, Bangladeshi and Burmese settlements are an exception.

SOCIO-ECONOMIC CONDITIONS

There are major socio-economic differences between the rural and urban areas. These are obvious from tables 2, 3, 4 and 5 in **Appendix - 3.1**. The population of less than 15 years of age in the rural areas is 46.1 percent while in the urban areas it is 39.25 percent. The rural female literacy is 12.23 percent and the urban is 56.66 percent. In the age group of 10 - 14

years, urban female literacy is 70.84 percent and rural is 22.63 percent. The percentage of married women in the age group of 15 - 24 in the urban areas is 31.72 as opposed to 59.28 in the rural. An analysis of the 1981 and 1998 census figures reveals that while social change is very slow in the rural areas, it is comparatively faster in the urban ones.

Table 5 in **Appendix - 3.1** describes the physical conditions in the rural and urban areas of Sindh. These have a direct bearing on the health and economic conditions of the population. Only 13.53 percent of homes in the rural areas possess the facility of piped water inside their homes and 3.29 percent have water connections outside their homes as opposed to 68.21 percent and 6.17 percent respectively in the urban areas. Additionally, 55.69 percent of homes in the rural areas do not have latrines as compared to 5.7 percent in the urban areas. Electricity is available to 52.62 percent of homes in the rural areas as opposed to 93 percent in the urban areas.

A number of major development projects are being carried out in Sindh, both in the rural and urban areas. Many of them have adverse environmental impacts and are detrimental to the social and economic conditions of communities. Several such projects have led to large scale evictions and forced migration of the local population. The Left Bank Outfall Drain (LBOD), Right Bank Outfall Drain (RBOD) and the Chottiari Reservoir projects have had adverse environmental and economic repercussions. Similarly, the Lyari Expressway in Karachi is also displacing over 14,000 families according to government estimates, and over 25,000 families according to NGO estimates. Since May 1997, 17,438 housing units in the *katchi abadis* of Karachi have been demolished to make way for commercial plazas and high-rise middle income apartments⁴. These trends are creating social conflict in Karachi as well as in other urban areas of the province.

The funds for these mega projects were provided as credit to the government of Pakistan by the World Bank and the Asian

4. Ismail, Aquila. 2002. *Evictions*, City Press/Urban Resource Centre, Karachi



Woman artisan at work

Development Bank (ADB). The servicing of this debt is deducted at source from the Sindh development budget and is one of the major poverty indicators for the province.

The weakening of feudal institutions

The rural areas of Sindh have traditionally been dominated by feudal institutions and culture that were either land or tribe/clan based. Property and personal laws were settled through feudal institutions. The feudal system also: developed and maintained agriculture-related infrastructure; financed agricultural production; helped the state in managing law and order; created conditions conducive to the collection of revenue; and helped the state in delivering results that were required in the political process. Feudal institutions were able to perform these functions because of the lack of social mobility in the traditional caste ridden society, where all economic transactions at the grassroots level were conducted by barter. However, the feudal institutions are no longer able to fulfil their traditional responsibilities. This is because of

the emergence of a cash economy which is the result of green revolution technologies and the emergence of strong rural-urban economic links making social and economic mobility possible. *Arthi* and *baipari*, increasingly serving the needs of an urban market, have become the main financiers of agricultural production. The transporters who carry agricultural produce have also become an important vested interest lobby. The emergence of these actors is redefining the relationship between them and the traditional leadership in the urban and rural areas of the province.

These significant changes have coincided with a rapid expansion of the Sindhi speaking middle class, which is providing an alternative leadership to the old feudal one. In addition, there has been a growth of national and provincial NGOs that are helping rural and urban communities to organize for the management of agricultural production and the maintenance of agriculture related infrastructure. This is leading to the creation of a state of flux in class relations. (For more on the role of NGOs see Chapter 23, Non-governmental Organizations).

Employment

Karachi, the capital of Sindh and the country's only sea port, contains 30 percent of the province's population and 62 percent of its urban population. As a result, it exercises a strong influence on the economy and employment patterns in Sindh. Despite several attempts since the creation of Pakistan, the government has failed to develop industries in other parts of the province. Consequently, the educated youth from the rural areas seek employment in Karachi and settle in the city. Rural Sindh is losing its future potential leadership and only better education and employment opportunities in the rural areas would help in changing this situation.

According to a recent ADB report⁵, the extent of poverty in Sindh is 53 percent as opposed to 29 percent in the Punjab and 24 percent in the NWFP. The economically active population is estimated at 22.75 percent, but due to the widespread prevalence of child labour in the province, is actually about 32.73 percent. Of the labour force in rural Sindh, 65.56 percent is employed in agriculture, fisheries and forestry and 7.45 percent in other professions. Agriculture is practised mostly in the irrigated areas of Sindh. Rain-fed agriculture is erratic and is considered to be a blessing by the inhabitants of the desert regions and hilly tracts. Fisheries are concentrated in the barrage areas (Sukkur, Kotri and Guddu), in the natural lakes such as the Manchar and along the Karachi coast and the Indus Delta. Forestry is practised in the flood plains of the river and in the coastal regions. (For details on agriculture, fisheries and forests, see chapters 5, 6 and 9 respectively). In the urban areas, 33.66 percent of the labour force is classified as "professionals" and 18.23 percent as sales and service workers⁶. Most of the urban population is employed in the urban sector. According to the Karachi Development Plan 2000, 75 percent of Karachi's population works in the informal sector⁷.

EMERGING TRENDS

The urban population of Sindh is increasing at a faster pace (3.5 percent per year) than the rural population (2.2 percent per year). The change in the social indicators related to literacy, health, piped water and electricity are also increasing at a faster pace than in the rural areas, augmenting the rural-urban divide.

The control of the *arhi* and *baipari* on agricultural production and the consolidation of a cash economy and its formal and informal institutions are weakening the feudal system. The middleman economy is highly exploitative and there are attempts by community based organizations (CBOs), NGOs and other interest groups to strike a more equitable relationship with it by organizing communities and through the promotion of collective self-help and micro-credit programmes (see Box 3.1: Fisherfolk Organizations). This, along with the emergence of a larger middle class, will eventually challenge feudal leadership and values. Already there is considerable agitation against old feudal practices such as honour killings, and a strong movement for the conservation of the environment and natural resources is gaining momentum both in the rural and urban areas.

Because of the ineffectiveness of industrialization, housing, infrastructure and transport sectors, an informal sector has developed in these areas. To protect their claims and guard their gains, various actors of the informal sector have created strong organizations. These include the transporters' organizations such as: the Transport Ittehad; hawker's organizations like the Markazi Anjuman Imdadia Akhbar Froshan in Karachi; organizations of vegetable, grain and fruit merchants; organizations of garbage recyclers, and many others. Citizens' organizations in the urban areas have also developed to lobby for better environmental conditions, strict implementation of building by-laws, zoning regulations and protection of open spaces. (For details see Chapter 4, Urbanization and its Environmental Repercussions.)

5. Consultants Agrodev

6. MP&ECD/KDA. 1989. Karachi Development Plan 2000. KDA. Karachi

7. Hasan. Arif et al, 2002. Urban Change: Scale and Underlying Causes: The Case of Pakistan. unpublished report

Box 3.1: Fisherfolk Organizations

There have been some efforts by the fishing community to come together on a forum and try to tackle the problems that economic and physical changes have forced upon them.

Fishermen's Cooperative Society⁸

The Fishermen's Cooperative Society (FCS), Karachi, was formed in 1945 by boat-owners and traditional fishermen to manage the sale of fish, import machinery and gear, and provide welfare services to its members. A levy of 6.25 percent of the total value of fish sold at the auction is raised to run the expenses of the FCS. The objectives of the Society are:

1. To improve the standard of living and socio-economic conditions of member fishermen
2. To import and purchase fishing inputs, appliances and gadgets/crafts to be sold to its member fishermen
3. To obtain lease from government and local bodies
4. To arrange disposal of catch if and when required
5. To disseminate the knowledge of the latest improvements in fishing industry and encourage members to adopt it
6. To purchase stock and sell it on its own account
7. To establish or assist fishing and processing industry

The management of the business and affairs of the Society is entrusted to a board of directors consisting of not more than fifteen members. Eight are nominated from the government and seven directors are elected from amongst the bonafide fishermen.

*Mahigir Falah-o-Behbood Association (MFBA)*⁹

The MFBA was formed in Damb Bander in 1986 and had 140 members. Its objective was to pressure companies and middlemen to accept the system of deducting commission from the value of a catch rather than purchasing the catch at less than market rates from their creditors. But when the companies and middlemen put economic pressure on the members, along with threats of violence, the organization had to be discontinued.

*Mahigir Samaji Sangat (MSS)*¹⁰, (Rehri Goth)

The organization was established in 1990 and, quite unlike other organizations, comprises of young school-teachers working in government schools including women. These people came together when a vacant community owned piece of land was being clandestinely acquired by community leaders and councillors to be registered in their own names. The MSS lodged a formal complaint with the mukhtarkar regarding this illegal occupation. Additionally, the MSS made a colony of 300 plots on the community land to save it from being illegally occupied. However, this plan has not been officially approved.

In Karachi, there already exists a strong civil society. This can be judged from the fact that there are over 800 registered NGOs operating in the *katchi abadis*. A number of NGOs and community organizations are also emerging in

the smaller towns and rural areas of Sindh and are actively participating in movements against the Kalabagh Dam, the Thal Canal, honour killings and for better environmental conditions.

8. Syed, Khursheed Udin. 2002. Status Paper on Fisheries of Sindh. Prepared for the IUCN Sindh Profile

9. Hasan, Arif. 2002. The Unplanned Revolution. City Press, Karachi

10. Ibid



PART II

Green Sectors





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CHAPTER 4

Water Resources



Sindh survives almost entirely on the water of the River Indus as there is very limited groundwater available. Rainfall in the province is also only in the range of 100 to 200 mm per year, while the evaporation rate is between 1,000 to 2,000 mm. Thus, the whole of Sindh is arid and it is only the Indus which gives life to the province.



The magnificent Sukkur Barrage on Indus River

Since rainfall is scant and groundwater tends to be saline, river water has become the main sustainer of life in Sindh

The Indus River Basin starts from the Himalayas in the north and ends in the dry alluvial plains of Sindh in the south. The Indus Basin area is 0.944 million km². The vast alluvial plains of the Indus Basin (the Indus plain), covering an area of 0.21 million km², are relatively flat and largely made up of deep alluvium deposited by the Indus and its tributaries. The primary source of surface water is precipitation in the form of rainfall and snow, as well as the glacial melt. Glaciers in the upper Indus Basin are the largest outside the polar region and serve as natural reservoirs that provide the snowmelt for the Indus and its tributaries.

Soil in the whole of the Indus plain consists of over 304.8 meter deposits of unconsolidated and highly permeable alluvium. This alluvium mass is mostly homogeneous and forms a highly transmissive aquifer. Recharge to the aquifer is through rainfall, deep infiltration from the irrigated fields and seepage from unpaved irrigation channels.

THE AVAILABILITY OF WATER

Supply from Indus River

Compared to its increasing needs, water availability to Sindh is being reduced every year. The situation worsens during periods of drought. The yearly average availability of water in the province, computed from the data from year 1970 to 1997, is 45 MAF.

This information helps us to forecast the water security (water crises) of Sindh. According to the Water Accord of 1991 (Tables 4.1 and 4.2), Sindh has been awarded 48.76 MAF for both *Kharif* and *Rabi* seasons. The worst ever drought conditions in Sindh, experienced from 1998 to 2002, show that the province received much less water than allocated in the Water Accord.

Balanced river supplies, including flood supplies and future storage, are distributed among the provinces below.

Table 4.1: Water apportionment under the Water Accord (in MAF)

Province	Kharif	Rabi	Total
Punjab	37.07	18.87	55.94
Sindh *	33.94	14.82	48.76
NWFP (a)	3.48	2.30	5.78
(b) Civil Canals **	1.80	1.20	3.00
Balochistan	2.85	1.02	3.87
Total Allocation	77.34	37.01	114.35

Source: Water Accord, 1991

* including already sanctioned urban and industrial uses for metropolitan Karachi.

** ungauged civil canals above the rim stations.

Table 4.2: Distribution of Flood Supplies and Future Storage (in percent)

1.	Punjab	37
2.	Sindh	37
3.	Balochistan	12
4.	NWFP	14
	Total	100

Source: Water Accord, 1991



Tahir Qureshi

Unsafe water supplies cause many diseases

Groundwater Sources

Regular surveys have not been carried out to assess the availability of groundwater in the province. Various sources estimate that its volume is between 3 to 5 MAF scattered in 28 percent of the geographical area of Sindh. However, some experts suggest it to be less than these estimates. This water is found mainly along the Indus water channels and in the few natural underground streams.

In recent years, drought has caused excessive extraction of groundwater to make up for the lack of irrigation water. This, in turn, has resulted in rapid depletion of the groundwater and filling up of the underground freshwater channels and reservoirs with brackish water. There is an urgent need to conduct a survey for assessing the location and potential of ground water in Sindh.

Rain Harvesting

Little effort has been made towards harvesting rainwater in the province. Several projects like

the Mol Dam, Kacho Reservoir, the development of lakes, depressions and reservoirs, remain unattended. These water bodies can harvest rain for irrigating crops and can be used for fish farming. However, such projects can cause ecological damage if not well-planned and can also result in the eviction of communities from productive areas they have inhabited for centuries.

THE CURRENT SITUATION

Sindh has entered a phase of water insecurity. This calls for taking all possible measures to manage and conserve water resources. This is imperative for ensuring the continuity of life and economic development in the province. For example, in 1947, the per capita water availability in Pakistan was 5,000 cubic meters, which diminished to about 1200 cubic meters in 2002. In Sindh, it is even less.

During the *Rabi* season of 2002, it was estimated that water was not available to more than 60 percent of the cropped land, constituting a serious threat to the food security in rural Sindh. Drinking water was also



Tahir Qureshi

The lining of water courses can prevent water losses



Waterlogging and salinity is affecting agriculture productivity

in short supply to many urban as well as rural areas. Due to these factors internal migration from water deficit areas is on the rise. According to newspaper reports people had protested against water shortages during 2001-2 in more than 100 rural and urban locations combined¹.

The water of the Indus River System is finite and Sindh's share has been fixed at around 49 MAF per annum (33.94 MAF in *Kharif* and 14.82 MAF in *Rabi*) in the prevailing Water Accord of 1991.

Sindh is almost exclusively dependent on the Indus Basin Irrigation System (IBIS). Any disturbance in the flow of water in the IBIS adversely affects the agriculture, economy, ecology and drinking water supply in the province. Thus a sustainable supply of the required volume of water in the IBIS is essential for the survival and economic growth of the province. Before estimating the annual availability of water to Sindh, it is essential to understand the IBIS.

The Indus Basin Irrigation System

The Indus River system can be divided into western rivers (Indus, Jhelum and Chenab) and eastern rivers (Ravi, Beas and Sutlej). The total flows of the western rivers belong to Pakistan while India has the right to the waters of the eastern rivers. All the rivers of the Indus system are perennial.

The irrigation system of Pakistan, fed by the Indus and its tributaries, is the largest integrated irrigation network in the world. The system consists of three major storage reservoirs, 19 barrages, 12 inter-river link canals, 43 independent irrigation canal commands, and over 107,000 watercourses. These are complemented by a surface drainage system. The total length of the canals is 61,000 km whereas watercourses and farm channels measure another 1.6 million km. A watercourse generally commands 80 to 320 hectares. The system draws an average of 106 MAF of surface water each year for irrigation, supplemented annually by pumped groundwater of some 43 MAF. The overall irrigation efficiency

1. Reported in Kawish, Hyderabad, 2001-2002



Drain carrying industrial effluent

of the IBIS is around 36 percent². Map - 4.1 show the barrages and dams on the Indus River System in Pakistan and Map 4.2 show the irrigation system in Sindh.

The irrigation canals of Sindh were extended and improved by the British in the late 1800s. By 1910, the irrigated area had expanded to 1.4 MHA. Sukkur Barrage, completed in 1932, increased the annual cultivated area to 2.37 MHA. The completion of Kotri Barrage (Ghulam Muhammad Barrage, 1955), and Guddu Barrage (1962) brought the rest of Sindh's irrigation system under barrage control. The total command area under the three barrages was 5.1 MHA in 1997-98³.

There are 13 existing surface drainage systems in Sindh that serve a total area of over 2.5 MHA

and have an aggregate length of about 4,800 km. Additional drains are under construction. During the year 1999-2000, the total irrigated area using all sources in Sindh was of the order of 2.52 MHA. This included 2.39 MHA in the canal commands and 0.13 MHA irrigated by private wells and tube wells⁴.

The irrigation system presently comprises of 14 canals, 1200 distribution channels and 47,400 watercourses. On an average, Sindh has drawn 45 MAF during the period of 1970 to 1997⁵. The average water withdrawal from three barrages during the same period is shown in Table 4.3.

Data from 1980-81 to 1997-98 demonstrates that about 95 percent of the farmland in Sindh gets water from the irrigation system and the

Table 4.3: Average Water Withdrawal from Barrages in Sindh (in MAF)

	Guddu	Sukkur	Kotri	Total
Yearly average	9	26	10	45

Source: 25 years of Sindh in Statistics, Government of Sindh, 1998

- NWFP Agriculture University and Wageningen Agricultural University, 1997. *Water Management in NWFP*. The Netherlands
- Government of Sindh. 1998. 25 Years of Sindh in Statistics. Bureau of Statistics. Karachi
- Asian Development Bank /Government of Pakistan. 2001. National Water Sector Profile
- Government of Sindh. 1998. 25 Years of Sindh in Statistics. Bureau of Statistics. Karachi

Table 4.4: Average Irrigated Area of Sindh (1970-97) (MHA)

Geographical area	Command of Sindh barrages		Irrigated land	
	Area	Percentage of geographical area	Area	Percent of geographical area
14.091	6.3	45	4	29

Source: 25 Years of Sindh in Statistics, Government of Sindh, 1998

Table 4.5: Province-wise Land-use (1997-1998) (MHA)

Province	Geographic area	Cultivated area	Net area sown	Area sown more than once	Total cropped area	Percent of geographical area
Punjab	20.63	12.34	11.11	4.85 Estimated	15.96 Estimated	77.4
Sindh	14.09	5.68	3.04	0.91	3.95	28
NWFP	10.17	1.91	1.57	0.59	2.16	21.23
Balochistan	34.72	2.11	0.97	*	0.97	2.8

Source: Draft South Asia Water Vision 2025, Country Report, Pakistan

rest is cropped with the help of tube wells⁶. The average irrigated area of Sindh is depicted in Table 4.4 and Table 4.5 shows province wise land use. Data on the area being cropped with rainwater has not been collected by any private or public agency.

The Crisis in Agriculture

The low irrigation efficiency of the IBIS and waterlogging (affecting an estimated 37.6 percent of the gross command area) and salinity pose serious threats to the sustainability of irrigated agriculture. The twin problems of waterlogging and salinity are most pronounced in Sindh. The province contains more than half the waterlogged and salinity affected areas of Pakistan.

Due to defective irrigation practices (such as flood irrigation, absence of properly organized management and distribution) and lack of drainage facilities, more than 50 percent of the

cultivated area in Sindh is severely affected by waterlogging and salinity⁷. However, with the current drought having lowered the water table, what needs to be surveyed is the land that has been reclaimed due to its impact.

According to some reports a reduction of 25 percent in the production of Pakistan's major crops is attributed to soil salinity alone. In Sindh where the problem is much more severe, it is estimated that the impact may be closer to 40 to 60 percent. In addition, there are serious environmental and poverty impacts associated with waterlogging and salinity⁸.

Land Use

Land in Sindh is under different uses such as human settlements, agriculture, industries, roads, canals and distribution channels, drains, forestry, and fisheries. A large part constitutes the arid zone (62.4 percent of the land) spread over an area of 88,000 km². This includes the

6. Government of Pakistan, Agriculture & Livestock Economic Wing, Ministry of Food, 2000. Agricultural Statistics of Pakistan 1998-99. Islamabad

7. Asian Development Bank. 2000. 'Rapid Assessment of LBOD'; Manila

8. Mirani, M. 2002. Status Paper on Water Resources in Sindh. IUCN

Table 4.6: Land Use in 1997- 98

Land use	Area (MHA)
Forest area	0.69
Not available for cultivation	6.26
Cultivated	5.68
Current fallow	2.64
Net area sown	3.04
Area sown more than once	0.91
Total cropped area	3.95
Geographical area	14.09

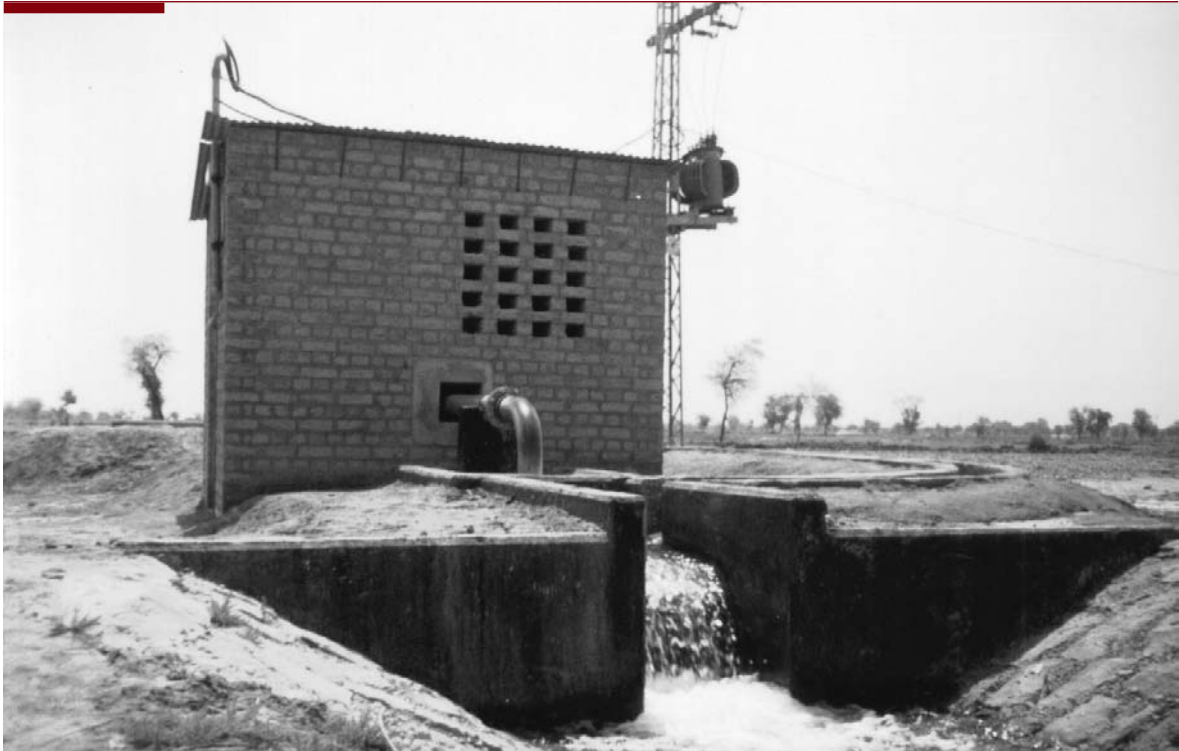
Source: Draft South Asia - Water Vision 2025, Country Report, Pakistan

western hilly tract of Kohistan and the eastern desert area of Tharparkar. Table 4.6 describes the land use distribution in the Province. The absence of comprehensive land use data makes it difficult to discuss scientifically the relation between water and land use. However, an attempt has been made in the following section.

Agriculture in Sindh is primarily dependent upon canal irrigation. For example, in 1998-99, out of the total cultivated area of 2.88 MHA, 2.53 MHA was irrigated through the canal system and only 0.13 MHA was cropped

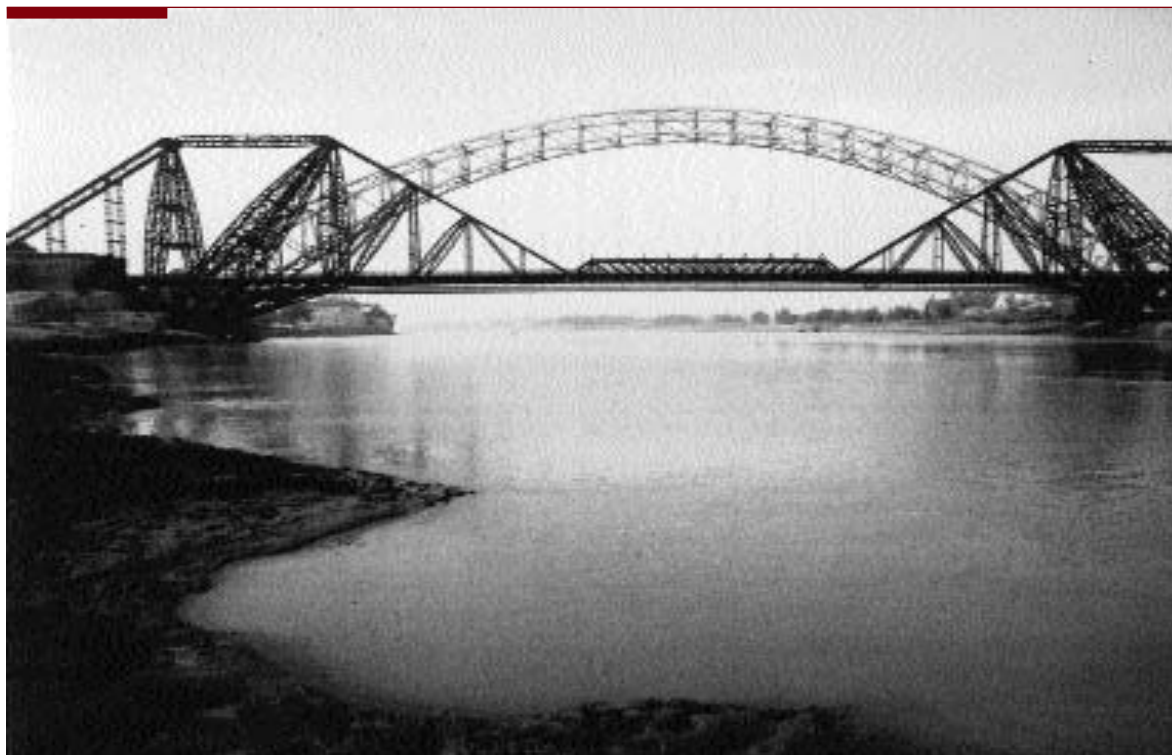
through tube wells. Data on rainwater cultivation is not available. During the year 1999-2000, the total irrigated area using all sources in Sindh was 2.52 MHA, which included 2.39 MHA in the canal commands. Table 4.7 depicts the irrigation sources for all provinces of the country.

It is worth mentioning that out of 6.26 MHA of land not available for cultivation, more than 2.0 to 3.0 MHA can be brought under cultivation, provided Sindh gets its due share from the Indus River system and new canals and irrigation channels are constructed.



Mukhtiar Azad

A tube well of saline water in LBOD Nawabshah



Lansedown Bridge on Indus connects Sukkur and Rohri

Every year, the twin menace of waterlogging and salinity, shortage of water, and sea intrusion degrade thousands of hectares of land. In Thatta district, for example, 0.48 MHA land has been affected by sea intrusion alone. Continued drought of more than three years has increased desertification in the province, particularly in the area bordering the arid zone and the tail-end of the irrigation channels.

Population Increase

Due to Sindh's finite water resources and its increasing population, the province is facing a

serious water crisis. The current population growth (2.8 to 3.0 percent) in Sindh is highly unsustainable considering its limited natural resources, particularly water. The high rate is due to urban growth because of economic migration from other countries as well as from other provinces. In 1971-72, when the population of Sindh was 14.156 million, the water supply was 39.3 MAF. After 27 years, water availability was 48.8 MAF when its population increased to 30 million in 1998. Thus, per capita water resources declined fast due to the high population growth and the inefficient usage of available water in the Indus River System.

Table 4.7: Irrigation Sources in Different Provinces for 1999-2000

	Total MHA	Govt canals %	Canal & tube wells %	Private canals %	Tube wells %	Canal wells %	Wells %	Others %	Total %
Punjab	13.84	28.4	50.5	....	19.1	0.7	0.9	0.4	100
Sindh	2.52	94.8	....	....	5.2	....	....	....	100
NWFP	0.89	43.8	....	41.6	6.7	....	4.5	3.4	100
Balochistan	0.81	49.4	....	11.1	28.4	....	2.5	8.6	100
National	18.06	39.4	38.7	2.5	17.0	0.5	1.0	0.9	100

Source: ADB/GOP, National Water Sector Profile, 2001

Box 4.1: Waterlogging and Salinity

Waterlogging: Natural sub-surface drainage through down-valley movement of groundwater is restricted because of the flatness of the Indus Plain. Persistent seepage over the years from unlined canals and large network of distributary channels and irrigation surpluses from the field has caused the water table to rise close to land surface creating waterlogged conditions.

The area with groundwater level less than 1.5 m is considered a disaster area by WAPDA. It is a primary candidate for drainage treatment. In pre-Sukkur barrage days, the groundwater level in Sindh was below 30 feet. Intensive use of Indus water for irrigation has altered the hydrological balance of basin-seepage losses and deep percolation has resulted in gradual rise in the water table resulting in waterlogging and salinity in many areas. The Indus basin has a flat topography, porous soil, and semi-arid climate with high evaporation rate. In these conditions, the requirement was to develop a proper drainage system in parallel with an irrigation system to control waterlogging but that was not done.

Salinity: There are two major causes of salinity: Irrigation water contains high dissolved solids (TDS) and when this water evaporates, the salt gets left behind. Secondly, capillary action moves water to the ground surface which, if not transpired by plants, evaporates leaving salt behind.

About 10 tons per year of salt is brought in by Indus river in Sindh while around 4 tons per year of salt is mobilised through the usage of groundwater through tubewells. The water from tube wells contains high amounts of TDS, and its injudicious use has contributed significantly to salinity. The irrigation system is required to supplement the natural rainfall but it must be complemented by an effective drainage system to ensure a satisfactory balance between moisture and salt concentration in the root-zone. It ensures that root-zone contains sufficient moisture to allow crops to extract water required for transpiration and at the same time does not remain saturated for an extended period.

In Sindh, the construction of a drainage system started in 1970, with the initiation of small-scale projects such as the Salinity Control and Reclamation Project (SCARP). The move culminated in launching two major drainage systems on both sides of Indus; that is the LBOD and RBOD, in 1986 and 1995, respectively.

The sodic soil containing high amounts of exchangeable sodium can also be reclaimed by replacements of exchangeable sodium with calcium that will improve soil permeability and leaching. Gypsum is normally used as chemical amendments to reclaim sodic soil. In the biological technique, salt tolerant plants, like Kaller grass, Jentar and rice are grown since they are tolerant to saline soil conditions.

Source: Bhutto, Abdul Waheed, Land Degradation of Sindh, Dawn October 2002

Shrinking Delta

Originally, the Indus Delta occupied about 2600 km consisting of creeks, mudflats and forests between Karachi in the north and the Rann of Kutch in the south. There were 17 major creeks making up the original delta, but due to reduced flows below Kotri after the construction of Tarbela Dam and other barrages, only the area between Hajamro and Kharak creeks now receives water from the Indus with Khobar Creek as the main outlet to the sea. The active

delta is now only ten percent of its original area. The Irrigation Department of Sindh has revealed that, as a result, seawater intrusion has caused a tidal infringement over 0.485 MHA of land in the coastal area, which is about 33 percent of the total land (1.525 MHA) in the districts of Badin and Thatta. Also, due to the intrusion of the sea and the drastic reduction in fresh water supply, the mangrove cover in the delta has been seriously affected. If the conditions persist, it will not be long before the Indus delta would be completely devoid of mangrove cover.



The livelihood of Manchar Lake is threatened by increased pollution

Pollution

Water pollution in the Indus occurs through:

- **Municipal discharges:** as most of the cities and towns in Sindh discharge their municipal waste into the Indus River, particularly organic matter which causes depletion of dissolved oxygen of the river water. In extreme cases when the assimilative capacity is exceeded, anaerobic (septic) conditions arise especially during months of low dilution or when there are water shortages in the Indus. These conditions cause groundwater pollution.
- **Industrial water discharges:** Ions of sodium, potassium, calcium, magnesium, carbonates and bicarbonates and other inorganic variables like fluoride, silica and cyanide pollute water resources. Metals such as cadmium, chromium, copper, mercury, lead, zinc and nickel are also effluents discharged by industries.
- **Return agricultural flows through drainage structures:** particularly through the LBOD

and the RBOD adversely affect Sindh's water resources.

Water Distribution Issues

Inter-provincial conflicts over water distribution have been reported, including the construction and regulation of reservoirs and link canals upstream and future water resources development. Sindh being a lower riparian of the Indus River System has concerns regarding water development schemes upstream that may affect its economic, ecological and social growth.

Water Accord 1991

The latest accord on water distribution among the provinces came into existence in 1991 and laid down the following clauses.

- Water apportionment for Sindh includes that sanctioned for urban and industrial uses for Karachi and will be given priority.
- The need for other storage facilities on the Indus and other rivers was admitted and



Guddu Barrage on Indus River

- The need for a certain minimum escapeage to sea, below Kotri, to check sea intrusion was recognized, Sindh held the view that the optimum level was 10 MAF, which was discussed. It was decided that further studies needed to be undertaken to establish minimal escapeage needs downstream.
 - The Indus River System Authority would be established to implement the accord with representation from all four provinces. Its headquarters would be based in Lahore.
 - No restrictions on Provinces to undertake new projects within their allotted shares.
 - No restrictions were placed on small schemes not exceeding 5000 acres above elevation of 1200 ft.
 - The system-wise allocation will be worked out on a 10 day basis and record of actual average system uses for the period 1977 - 82 would form the guideline for developing a future regulation pattern.
- The requirements of LBOD will be met out of the flood supplies in accordance with the agreed sharing formula.
- Sindh based political parties and civil society forums are concerned about the nature of the accord and the apportionment of water as designated by it. They fear that if the issue of water distribution is not dealt with it would have unprecedented human, economic, and environmental disasters in the Province.
- One of the major causes for concern, as perceived by Sindh, is that the availability of water in the Indus Basin Irrigation System (IBIS) may not be what it has been projected to be. In this context the people of Sindh are apprehensive that the construction of Kalabagh Dam and other water reservoirs proposed in WAPDA's Vision-2025 would, due to the non-availability of surplus water in the IBIS, prove to be unsustainable and that these projects would most likely reduce the province's water share in the future. Similarly, it is also feared that the construction of the Greater Thal Canal would further divert Sindh's share of River Indus waters.
- Another issue that is of considerable concern is that of the upstream diversion of Indus water

through link canals during periods of acute water shortage, which is considered to be at the cost of Sindh's share as recognised in the Water Accord. Furthermore, it is of great importance that the quantum of required water flow in the Indus below Kotri be determined. Sindh fears that the depletion of downstream flows of Indus water will cause irreversible damage to the socio-ecology of the Indus Delta and the Sindh coastline. In order to address these concerns it is imperative that the authority and role of Indus River System Authority (IRSA) be upheld.

Water Resource Development

Regarding water resource development, a significant contribution to Sindh's requirements has not been made after the construction of the Guddu Barrage. Though the Jamrao Canal has been re-modelled, the Chotiari Reservoir has been constructed, and a substantial number of watercourses have been lined, there is a need for more initiatives. There is a need to invest in the construction of the Sehwan Barrage, Reni Canal, Thal Canal and to remodel the entire irrigation system to increase water efficiency and the availability of water. The government recently announced the construction of the Reni

Flood Canal but is facing opposition from the farming community, which doubts the projected benefits and sustainability of the project. The Chotiari Reservoir has also reportedly caused large-scale displacement of old fishing communities of which there is strong criticism from civil society organisations.

The lining of watercourses can help prevent waterlogging. So far, four percent of the watercourses of Sindh have been lined (length-wise), compared to 50 percent of the watercourses in the Punjab. Recently, the federal government announced Rs. 10 billion to update the irrigation system in the province, but it has to be seen how this money is spent. In addition, the federal research institutions such as the National Agriculture Research Centre and Pakistan Agriculture Research Centre are largely invisible in Sindh and have not helped in developing models for tackling water management issues.

Continued conflict among the provinces over the distribution of Indus water, defective water, inefficient cropping patterns, use of outdated irrigation technology and lack of investment for the remodelling of the irrigation system, are



Tahir Qureshi

Water bodies require regular maintenance activities

major obstacles in conserving water in the province. As a result, whenever drought recurs in the country, a large number of people suffer from the unavailability of water. This exacerbates poverty, deteriorates the health of the people, promotes unemployment, and degrades the environment.

Due to lack of funds and an ineffective management system, the public research institutions working in this sector have not succeeded in undertaking applied research projects or transferring conservation technologies on a wide scale. While public universities have the expertise and the infrastructure to conduct such research, financial and institutional constraints prevent them from doing so.

EMERGING TRENDS

It is extremely difficult to forecast the water needs of Sindh for the future due to several unpredictable and complex socio-economic and demographic factors and the non-availability of reliable data. There is also uncertainty regarding future economic development in Sindh in the coming 25 to 50 years. The four scenarios of water availability to Sindh depicted in Table 4.8 have been assumed, considering the changing climatic pattern. This helps to understand the possible shortages for Sindh if there are drought conditions or if water flowing from the Indus is reduced considerably.

The declining water availability in all scenarios is due to the fixed share of Sindh in the IBIS.

More than 70 years' recorded data show that annually Sindh will not get more than 45 MAF.

Due to scarcity of freshwater the riverine forest, irrigated plantations, mangrove forests and wildlife have been adversely impacted. There has been a loss of biodiversity and some species of fauna flora have disappeared or are at the verge of extinction.

The farmers, or *hari*, are becoming significantly impoverished due to water scarcity, among other factors. In several areas, particularly the tail ends of water channels and watercourses, out-migration has begun due to a perpetual shortage and irregularity of water supply. Frequent and widespread demonstrations are held by the people against water shortages in the province, which have become increasingly politicised.

The arid zone (including the desert along the eastern border and the hilly area along the western border of Sindh, covering 60 percent of the province's geographical area), the coast and the waterlogged areas (Badin, Thatta, area between Khairpur and Naushero Feroz along with the left side of the National Highway), the rice growing region in upper Sindh and the tail areas of Nara Canal are likely to remain perpetually poor regions due to recurring water-related disasters, neglect by the government, degradation of land and shortage of water. More recently, the disposal of saline water in the Manchar Lake from the RBOD has resulted in the depression of fish resources and the degradation of land in the catchment area of the lake. Thousands of fisher families have left the lake due to this environmental destruction and

Table 4.8: Future Availability of Water in Sindh

Year	Population (million)	Water flow to Sindh (MAF)			
		Per Capita Water Availability(Cubic meter)			
		45	40	35	25
1998	30	1852	1646	1440	1029
2002	34	1634	1452	1271	908
2010	43	1292	1148	1005	718
2020	56	992	882	772	551
2030	75	741	658	576	412

Note: Due to increasing migration and high birth rate, a growth rate of 2.8% for Sindh has been assumed
Source: 25 years of Sindh in Statistics, Government of Sindh, 1998



The shrinking Indus Delta

the families who have decided to stay are experiencing increasing poverty (see Box 4.2: Manchar Lake).

Migration has increased from all the rural districts of the province where water is unavailable for irrigation and drinking purposes. The Sindhi media regularly reports this phenomenon and experts predict that this internal migration will not only continue but also increase if water is not made available to water deficit areas.

STAKEHOLDERS

The Water sector is such a large and complex one that no single institution can act on its own to work for a sustainable supply. It requires multi-sectoral, multi-disciplinary, and multi-institutional actions for its security, conservation, and sustainability. In Sindh, the following institutions are the major stakeholders in water management:

The Federal Government

According to the constitution of Pakistan, the federal government is responsible for policy

making and investment in water resource development, and ensuring the fair distribution of water amongst the four provinces. It is also responsible for efficient farming and irrigation practices researched by institutions such as Pakistan Agricultural Research Council (PARC) and National Agriculture Research Centre (NARC).

The Sindh Government

After the federal government, the Sindh government is mandated for water distribution within the province, the planning and development of water resources, research in farming and irrigation, and the mobilisation of farmers and other stakeholders for water conservation. Currently, it is only involved in water distribution.

The Farming Community

Farmers are the largest users of water in the province with 97 percent of the water used for agriculture. They have an important role to play in the conservation of water. The government has introduced institutional reforms aimed at mobilising farmers for the efficient use of water

Box 4.2: Manchar Lake

Manchar Lake, a threatened wetland dying from pollution and mismanagement, was once considered the largest freshwater lake in Asia. It is located about 12 miles west of the town of Sehwan Sharif and spread over an area of 100 square miles that was once renowned for its beauty and the large population of migratory birds and wild fowl. According to a survey conducted in 1930, there existed about 200 different species of fish in the lake. Today, 14 of these species have perished and several others are under severe threat of extinction from the lake.

The water supply for Manchar Lake depends on water flows from River Indus via Aral Wah and Danistar Wah, storm water and hill torrents from Kirthar Hills and effluents from drainage units via Main Nara Valley Drain. Over the last two decades, the fresh water intake of the lake has declined significantly relative to the saline and toxic effluents discharged into it.

The history of the pollution problems of Manchar Lake goes back to 1921 when the Main Nara Valley (MNV) drain, originally an inundation canal, was remodeled to take in raw sewage from the towns of upper Sindh and central Punjab (including Larkana, Shikarpur, Sukkur, Khairpur, Dera Ghazi Khan and Muzaffargarh). This remodeled MNV drain became the only source of drainage in the right bank area of the Sukkur Barrage. Under the RBOD project, the MNV drain was further widened and remodeled to drain the saline water of Salinity Control and Reclamation Project (SCARP), with tube wells and the effluent from industries in District Dadu, adding toxic waste and chemicals to the lake. The establishment of dams and diversions in the upstream of Indus created a water shortage in Indus downstream, resulting in the lack of fresh water flow to Manchar.

Surveys have confirmed that a record fish catch of about 2,300 tones per annum has dwindled to just over 400 tones per annum. Migratory fauna, including beautiful cranes, no longer fly to the lake. Not only does the lake stand completely abandoned by its flying visitors; the indigenous population of birds has also diminished considerably. The testing of samples of lake water shows that the range of salinity in the lake has reached 4,000 ppm against the desirable limit of 500 ppm, obviously reducing its nutrition level for sustenance of natural habitats. Furthermore, the present level of toxic particles in Manchar Lake is more than 8,000 ppm as compared to the safe human consumable level of 800 ppm.

Issues

- Pollution of lake water due to disposal of effluents of industries and SCARP tube wells (causing high toxicity and salinity levels of lake water), solid waste disposal (including non-degradable polythene bags, petrochemical products) and sewerage.
- Degradation/destruction of natural habitat/ecosystem leading to loss of biodiversity of local flora and fauna.
- Unsustainable and environmentally harmful fishing practices (fishing nets of non-natural fibres, calcium carbonate mixed with food grains, diesel and petrol discharges from motors fixed on boats).
- Manchar Lake is an unprotected wetland (not among the eight declared Protected Wetlands in Pakistan).
- Economic impact, loss of livelihood, and mass migration (the average household income is between Rs. 1,000 and Rs 3,000 per month).
- Nonexistent civic facilities and infrastructure, little or no access to health facilities, and poor housing.
- Prevalence of TB, anaemia, malnutrition, gastroenteritis and water-borne skin diseases. It has been estimated that more than 80 percent of the women and children suffer from these diseases.

Source: IUCN

and for the operation and maintenance of irrigation channels. The results have yet to emerge.

The Private Sector

There are a large number of domestic, industrial, and commercial users of water. There is no adequate and reliable data on their water use, including their water efficiency. The empirical evidence shows that water efficiency

is low and there is a definite need to conserve water used by the private sector. With improvement in the water market, water efficiency of the private sector water users can be significantly increased.

Research and Academic Institutions

There are scores of public and private universities and several research institutions in the province that play an important role in

Box 4.3: The Left Bank Outfall Drain Project

The Left Bank Outfall Drain Project (LBOD), a multi-million Rupee venture, was designed and launched with the twin objective of providing a long term solution to the drainage problem of Sindh and to salvage thousands of acres of fertile land rendered barren by the dual menace of water-logging and salinity. However, the LBOD has proved to be another one of the mega projects that have fallen miserably short of their envisioned objectives.

Impacts

- The Tidal Link of LBOD, designed and constructed with the cost of Rs. 785 million, despite the objections of the local communities on its design, has resulted in the degradation of land and increased the incidence of poverty in Badin and Thatta districts close to the sea. Interestingly, it was during the construction of this link that the local communities of these districts opposed the link project vehemently, terming it as dangerous for the fertile lands and the environment of the area. Their objections were based on the unnatural design of the sub-project, which was going to choke the natural flow of drainage in the area. As the Tidal Link project was completed in 1995, the concerns of the local communities started proving valid. The banks of the newly constructed Tidal Link were washed away by the floods in the same year, resulting in inundation of fertile lands with toxic drainage water.
- No provision had been made for the accommodation of effluent from the Kotri surface drain in the design of the Tidal Link. Water from Kotri surface drains was previously drained through lakes into natural creeks but this channel was obstructed by the construction of the Tidal Link. Hence, this drainage water, which always evaporated in the winter season, has now become stagnant and has been the cause of the rising water table and the ensuing problem of water-logging and salinity across thousands of acres in Badin district.
- Mostly all the drains of Kotri surface drains have a back flow due to the intrusion of seawater, which has also contributed, to the raising of the water table in the area and the degradation of fertile lands.
- The construction of the Cholri Weir was also opposed on the same premise. In 1998, a major portion of this weir was wave washed by sea tides. Officials confirmed that about 400 feet out of the total 1,800 feet weir had been wave washed posing great threat to the water level of the lakes and the lands of the area. The cause of the project's failure was attributed to defective design.
- Despite the time and money spent (Rs. 5 billion) on the project, the Chotiari Reservoir component of the LBOD is yet to be completed.
- The environmental impact of the LBOD project has been devastating. The intrusion of seawater into the lakes has rendered them highly saline, destroying the local ecosystem and disturbing the ecological balance. The water level of the lakes remains high, not allowing the effluents from surface drainage of Badin district to flow into them. The soil is becoming increasingly waterlogged and saline, which is affecting agricultural lands in the vicinity.

Source: IUCN

producing human resources in the water sector and can contribute to the transfer of water conservation technologies.

Civil Society Forums

Political parties, NGOs, public advocacy groups, women groups, media and others constitute the civil society in Sindh. Some citizen organisations such as Sindh Agriculture and Forestry Workers' Cooperation (SAFWCO), Sindh Rural Support Programme (SRSP), Thardeep Rural Development Programme (TRDP) and National Rural Support Programme (NRSP) are playing an effective and active role by promoting the conservation of water and demanding its equitable distribution. Their activities include organising workshops and conferences, training in land and water conservation, credit for small scale irrigation, mobilisation of the media, and lobbying with the government. But there is need for a more proactive role as well as networking with each other for water rights, water conservation, and equity in water distribution.

International Donors

Many UN organisations and international donors have been actively involved in

improving irrigation efficiency, the conservation of water and the development of institutions engaged in the water sector. However, their attempts at building a drainage system, such as the LBOD, have resulted in major environmental and ecological disasters and have increased Pakistan's international debt considerably. (See Box 4.3: The Left Bank Outfall Drain Project).

FUTURE ACTION

To ensure sustainable water supply for agriculture, drinking and industrial uses, and for protecting the natural environment of Sindh, the province must ensure better management and conservation of its water resources.

For increased water supply, building of carry-over reservoirs in the northern part of the country should be made a priority. If these are not built, the current water share of Sindh in the IBIS will not be sufficient to meet Sindh's growing domestic, industrial, agricultural and environmental needs of water.

Given the finite and limited land and water resources of Sindh, the population growth of the province has to be reduced through population planning. At the same time, industrialisation has

Box 4.4: The Right Bank Outfall Drain Project

The Right Bank Outfall Drain (RBOD) is a long term project to drain out sewage and waste from towns and agricultural lands on the right bank of the River Indus. These areas are both saline and waterlogged. Under the Right Bank Master Plan, developed with the assistance of the Overseas Development Agency (ODA), WAPDA has undertaken some drainage works on a priority basis. Many proposals were suggested. These include the construction of a link canal that would dispose of the effluent from the RBOD into the Indus. The EPA proposed the option of disposing the RBOD effluent into LBOD through a siphon, crossing the river. Draining the effluents into man made or natural ponds in the Katcho area beyond FP Bund was also an option, as was constructing a drain on the right bank parallel to the Indus River up to the Arabian Sea for directly disposing off the drainage water into the sea.

Instead, the water was disposed into Manchhar Lake through the Main Nara Valley (MNV) drain. Manchar was adversely affected by this. (See Box 4.2). Therefore, it has been decided that another route to the disposal of drainage water will be adopted. It will now be drained into the Arabian sea. The completion of the 24 km long Indus Link will end the degradation of Manchhar, but will pose problems of its own. Environmentalists fear that this would endanger human life, the agricultural system and environment in and around the Kotri barrage. The proposed link is designed to connect the MNV drain with the Indus near Bhan Saeedabad town in Sehwan subdivision of Dadu district. This will disturb the bio-diversity of the River besides posing a threat to human life and irrigation systems in lower Sindh.

Source: <http://www.iucn.org/reuters/1999/articles/winningpakistan.htm>. Brohi, Sikander, Disastrous Impacts of Indus Link Outfall of RBOD

Box 4.5: Water Management Project Launched in Sindh

In October 2003, the Science and Technology Ministry launched a project for efficient water management in the irrigated areas of the Southern Indus plain. To be executed by the Pakistan Council of Research in Water Resources through the Drainage Research Centre, Tando Jam, in five years, Rs. 40 million had been allocated for it. It will be implemented in the selected areas of Hyderabad, Nawabshah, Thatta, Mirpurkhas, Larkana, Sukkur, Dadu and Badin districts.

- Water management and agriculture related issues and problems in the southern Indus plain will be identified.
- A plan for sustainable water resources management will be developed to enhance water productivity.
- Pilot projects will be set up with the farmers' participation.
- A survey of the selected districts will be carried out to document the status of water resources management and agriculture practices.
- Skimming well technology, laser levelling, bed and furrow irrigation system, zero tillage technology, irrigation scheduling, pressurized irrigation system, use of low quality ground water and other techniques will be introduced at the fields under the project.

Source: <http://www.dawn.com//2003/10/15/nat11.htm>

to be increased to reduce economic dependence on agriculture for getting maximum economic returns from the available water supply.

For its development and sustainability, the water sector needs strengthening of a partnership between all stakeholders, including civil society forums. All institutions and forums related to the water sector need to cooperate with each other and support the common programmes for water resources development in the province. And finally, the ecological, socio-economic, and environmental repercussions of development projects should be carefully studied before they are implemented to make sure that no more disasters take place. For this, the involvement of local communities and their knowledge in the planning and implementation process is absolutely essential.

The coastal ecology of Sindh needs to be protected. That calls for a minimum water supply below Kotri as provided in the Water Accord. Conservation of lakes/wetlands, riverine areas, rangelands and the Indus delta,

has to be made a priority, as these environmentally sensitive areas need special attention and measures for their conservation.

Low water-use efficiency is the country's pressing problem and it needs to be increased and brought to the highest possible level through the use of latest irrigation technology including the promotion of water-efficient crops and land levelling. This also calls for exploring other options for example, desalination so as to increase the supply of water.

Increased use of groundwater has threatened the natural groundwater balance and has led to severe damage to the soil environment as well as to the supply of drinking water. Excessive groundwater extraction must be curbed in order to maintain this balance. Policies should be thus framed to ensure the equitable distribution of water among these zones in periods of water shortage.

Water users, particularly farmers and the private sector, should be involved in water conservation projects. Without their participation, water sustainability cannot be ensured.



CHAPTER 5

Agriculture



A

griculture is the foundation of Pakistan's economy. It contributes about 25 percent to the Gross Domestic Product (GDP) of the country. Sindh is a major contributor of staple crops in the country, producing 35 percent of rice, 28 percent of sugarcane, 20 percent of cotton and 12 percent of wheat, respectively¹. A majority of the people of Sindh depend on agriculture as their main source of livelihood.



Garlic

About 40 percent of the land in Sindh is arable land and 5 percent of it is rangeland. The total cultivated area in Sindh is 5.88 million hectares and the net area sown is 2.39 million hectares. The total cropped area is 3.10 million hectares, of which 0.71 million hectares are sown more than once¹. Sindh grows a variety of field and horticultural crops. Wheat, cotton, rice, and sugarcane are the major field crops, which constitute 68 percent of the total cropped area, while mango, banana and chillies are the major horticultural crops. Among the horticultural crops, Sindh produces 73 percent bananas, 34 percent mangoes, and 88 percent of the chillies. Of the total cropped area of 3.1 million hectares in the year 2000-01, almost 50 percent of the area was under food crops (wheat, rice, maize, sorghum, millet and barley), 25 percent under cash crops (cotton, sugarcane). The remaining area was under fodder (9.1 percent), pulses (4.7 percent), condiments (4.1 percent), oilseeds (3.8 percent), fruits (3.3 percent), and vegetables (1.4 percent).

Crop yields in Sindh are generally low and have remained either stagnant or have increased at

slow rates. The low availability of quality seed of crop varieties continues to be of major concern for agriculture. The use of crop inputs such as fertilizer and pesticides has increased considerably without a corresponding increase in yield levels. The supply of substandard and adulterated pesticides and fertilizers is also affecting crop yields and the cost of production. There is increasing degradation of the resource base such as soil, and current farming practices do not adequately address the issue of sustainability of crop production systems. This is in addition to the high cost of inputs and unstable market prices.

The farming community is, for the most part, below the poverty line and this is a major constraint to the development of agriculture. Farm mechanization is limited to the use of tractors and wheat threshers. Laser levellers are a recent introduction with considerable potential for enhancing yield levels and better use of irrigation water. Current water scarcity related problems demand the adoption of efficient water management practices.

THE AGRO-ECOLOGICAL ZONES

The irrigated areas of the province have been divided into three major agro-ecological zones, two of which are further divided into sub-zones, as given below.

- Zone A Rice/wheat zone of the right bank of river Indus (upper Sindh)
 - Sub-zone A1 Main area
 - Sub-zone A2 Piedmont soil region
- Zone B Cotton/wheat zone of the left bank of river Indus
 - Sub-zone B1 Guddu Barrage command area
 - Sub-zone B2 Sukkur Barrage command area
- Zone C Rice/wheat/sugarcane zone of lower Sindh

1. Agriculture Statistics, 2000-01

In addition to the above three zones, there are two more zones in Sindh. Map 5.1 shows the Agro-ecological Zones in Sindh. Zone D is a desert area in the east of Sindh, and Zone E is the western hilly zone. Main agricultural activity is, therefore, concentrated in the Zones A, B and C. Table 5.1 shows the main features of the agro-ecological zones including climate, water supply, soil and cropping pattern.

Zone A: It covers the districts of Shikarpur, Jacobabad, Larkana and the northern *taluka* of Dadu district. There are six main canals (three from the Guddu Barrage and three from the Sukkur Barrage) feeding zone A, three of which are perennial.

Zone A1 covers the districts of Shikarpur, Larkana and the northern *taluka* (Mehtar and

Table 5.1: Main Features of Agro-Ecological Zones including Water Supply, Soil Salinity and Cropping Pattern

Factor	Agro-ecological zones of Sindh				
	A1	A2	B1	B2	C
Climate					
Rainfall mm ^a	75-100	75-100	75-120	120-230	180-250
Rain period ^b	Jul-Aug	Jul-Aug	Jul-Aug	Jun-Sep	Jun-Sep
Evaporation ^c	150-175	150-175	175-200	200-225	150-225
Humidity	Low	Low	Low	Low-High	High
Winter temp ^o C ^d	8	8	8	12	10
Summer temp ^o C	44	44	42	40	30
Altitude masl ^e	40-60	40-60	40-60	5-40	0-5
Water Supply					
Perennial percent	55 percent	65 percent	0 percent	100 percent	50 percent
Irrigation area ^f	5,000	2,100	3,100	16,600	3,800
Tube well potential ^g	High	Low	High	High	Low
Soils					
Main types	Calcareous silt loam	Piedmont silt loam	Calcareous silt loam	Calcareous silt/clay	Saline
Salinity ^h	10 percent	5 percent	15 percent	15-50 percent	70 percent
Cropping					
Main <i>Kharif</i>	Rice	Sorghum	Cotton	Cotton	Rice
Other <i>Kharif</i>		Rice Fallow	Rice	High value Sugarcane	Sugarcane Vegetable
Main <i>Rabi</i>	Wheat	Wheat	Wheat	Wheat	Sugarcane
Other <i>Rabi</i>	Mixed Fodder	Fallow	Fodder	Fodder Vegetable	Fodder Vegetable

Source: Sindh Agriculture Extension and Adaptive Research Report (1994)

- Mean annual rainfall, millimetres
- Months experiencing more than 20 mm
- Annual evaporation, millimetres
- Winter: Mean minimum monthly temperature, January/December
Summer: Mean maximum monthly temperature, May/June
- Altitude, meters above sea level (masl)
- Thousands of hectares
- Tube well potential for drainage/Rabi water source
- Percentage of area with severe upper soil salinity problems
- High value crops: vegetables, orchards

Khairpur Nathan Shah) of Dadu district. Dadu, Rice and NWC Canals of Sukkur Barrage irrigate the zone. Rice is the major crop of the zone, followed by wheat while *Rabi* pulses and oilseeds are *dubari* crops. Wheat, sugarcane, oilseeds, *Rabi* and *Kharif* vegetables as well as guava and dates are also grown under the command of Dadu and NWC perennial canals.

Zone A2 covers the region of Jacobabad and Larkana districts. Here the soil is richer in clays than the soil of Zone A1, potentially more fertile and less prone to salinity problems. However, it is slower to drain. The major crop of the zone is rice in *Kharif*, followed by wheat, *Rabi* pulses and oilseeds as *dubari* crops.

Zone B: Zone B covers the left bank of river Indus in the districts of Ghotki, Sukkur, Khairpur, Naushero Feroze, Sanghar, Hyderabad, Mirpurkhas and Tharparkar. The entire zone is Indus flood plain. Saline soils are encountered throughout the zone. The problem tends to be more acute in the east of Ghotki and Sukkur Districts (Zone B1) and in eastern Sanghar and Mirpurkhas District (Zone B2). Cotton and sugarcane are the main *Kharif* crops of Zone B1. Oilseeds like sesame and

sunflower are also being cultivated increasingly in the zone due to water scarcity. Wheat, oilseeds and vegetables follow the *Kharif* crops.

Zone B2 lies in the command area of four perennial canals (Rohri, Khairpur Feeder East and West and Nara) of the Sukkur barrage covering the districts Khairpur, Naushero Feroze, Sanghar, Hyderabad, Mirpurkhas, and Tharparkar. The major *Kharif* crops of the zone are cotton and sugarcane, followed by sesame, sunflower, and groundnuts. In the *Rabi* season, wheat is the major crop followed by rapeseed, mustard, sugarcane, *Rabi* vegetables, and onion. The zone also produces mango, banana, *chiku*, papaya, citrus, and jujube.

Zone C: Zone C consists of lower Sindh, and is fed from the Kotri Barrage. It includes the Indus Delta and covers the districts of Thatta, Karachi, Badin (except taluka Matli and northern parts of Tando Bago) and *taluka* Tando Mohammad Khan of District Hyderabad. Zone C is more saline than any other area in Sindh. Salinity and waterlogging are most severe in this zone where drainage is difficult due to an absence of a gradient.



Abundance in a valuable cash crop: Cotton

The climate of Zone C is mild and humid, and it has the highest rainfall in Sindh (180 to 250 mm per year). However, its agricultural production is low. The main crops are rice and sugarcane in *Kharif*, which are followed by wheat and vegetables in perennial areas. The main vegetables grown here are onion and tomato and the zone also produces banana, *chiku*, papaya and coconut. Palm oil plantation has been successfully introduced in this zone.

Types of Soil

The Soil Survey of Pakistan has grouped approximately 80 percent Sindh soils into eight land capability classes according to their agriculture potential and the relative suitability for sustained agriculture use (see Table 5.2). Soils placed in Class I are generally very responsive to high inputs of water, improved seed, fertilizers, labour and also to improved management techniques, while lower classes have correspondingly decreasing response to inputs and management. Approximately 10 percent of classified land in Sindh falls under Class I and 20

percent under Class II and 15 percent under Class III. Arable area constitutes approximately 50 percent of the classified area in Sindh.

Salinity is one of the major soil problems confronting agriculture in Sindh. The problem is generally considered to be the result of the canal irrigation system, but countrywide soil surveys have established that most of the existing saline/saline sodic soils are not related to the present irrigation system, and their formation is the consequence of the gradual redistribution of salts already present in the soil. However, the canal irrigation system has certainly aggravated the situation. This kind of salinity, identified as secondary salinity, is relatively temporary and can be easily eliminated by adopting appropriate measures. Major factors responsible for the development of secondary salinity include lateral seepage of water from the canal system and its evaporation from the surface of adjoining soils, the rising of water table due to excessive percolation from the canal system and over-irrigation practices, inadequate availability of water, and accumulation of salts in low lying areas through runoff from surrounding saline soils.

Table 5.2: Extent of Land Capability Classes in the Surveyed Area of Sindh

Class	Sindh ('000 ha)	Pakistan (' 000 ha)	Sindh as Percent of Total	Agricultural Potential
I	1,097.8	5,362.2	20.5	Very high for general agriculture; moderate for rice
II	2,326.9	7,009.1	33.2	High for general agriculture; low to moderate for rice
III	1,496.9	4,888.0	30.6	Moderate for general agriculture
IV	742.5	3,623.8	20.5	Low for general cropping
V	—	171.1	—	High for forestry or range development
VI	8.3	1,270.3	0.7	Moderate for forestry or range development
VII	2,226.3	18,647.4	11.9	Low for forestry or range development
VIII	3,188.7	32,561.1	9.8	No potential for any type of economic agriculture
Unclassified	364.9	1,835.3	19.9	
Total	11,452.3	75,368.3	15.2	

Source: 1. Pakistan's Soil Resources: Pakistan National Conservation Strategy Sector Paper 4, 1993: data updated by Soil Survey of Pakistan in 2000
2. National Fertilizer Development Centre, Islamabad (2002)

The extent of soils affected by various types of salinity and sodicity in Sindh and other provinces is given in Table 5.3.

Waterlogging is another major problem in Sindh. An area is considered waterlogged when the underground water table is at a depth of five feet from the soil surface or reaches the root zone of the crops. Data shows that 3.8 million hectares of agricultural land in Sindh had a water table within 0 to 5 feet and 5.2 million

hectares at 0 to 10 feet in October 1999². The situation has changed over the past three years due to severe drought in the country and shortages in the supply of irrigation water.

The presence of adequate quantities of essential nutrients and organic matter are the basic components of fertile soil. Of the macronutrients, Sindh soils, like most soils of Pakistan, are invariably deficient in nitrogen. Phosphorus is deficient in 80 to 90 percent soils

Table 5.3: Soils Affected by Various Types of Salinity and Sodidity in Sindh and Other Provinces ('000 ha)

	Province				Pakistan	Sindh as Percent of Total
	Sindh	Punjab	NWFP FATA	Balochistan		
Soil with surface/patchy salinity and sodicity						
Irrigated	118.1	472.4	5.2	3.0	598.7	19.7
Unirrigated	0	0	0	0	0	0
Gypsiferous saline/saline-sodic soils						
Irrigated	743.4	152.1	0	76.6	972.1	76.5
Unirrigated	536.3	124.5	0	160.1	820.9	65.3
Porous saline-sodic soils						
Irrigated	257.0	790.8	25.7	29.4	1102.9	23.3
Unirrigated	150.1	501.0	7.8	364.0	1022.9	14.7
Dense saline-sodic soils						
Irrigated	32.5	96.7	0.9	0	130.1	25.0
Unirrigated	379.7	530.0	8.9	714.8	1633.4	23.2
Total	2217.1	2667.5	48.5	1347.9	6281.0	35.3

Source: 1. Pakistan's Soil Resources: Pakistan National Conservation Strategy Sector Paper 4, 1993; data updated by Soil Survey of Pakistan in 2000
2. National Fertilizer Development Centre, Islamabad (2002)

Table 5.4: The Irrigation Water Withdrawal during 1998 - 2002 (MAF)

Year	<i>Kharif</i>	<i>Rabi</i>	Total
1998	32.537	15.624	48.161
1999	32.523	12.251	44.774
2000	26.574	8.503	35.077
2001	25.682	7.100	32.782
2002	22.110	9.982	32.092

Source: Pakistan's Soil Resources: Pakistan National Conservation Strategy Sector Paper 4, 1993; data updated by Soil Survey of Pakistan in 2000

2. Agricultural Statistics of Pakistan, 2000-01



Farmers in the rice fields

despite the use of phosphate fertilizers for the last four decades. Potassium levels are generally adequate in the majority (60 percent) of soils whereas some, 40 percent of soils, are marginal to deficient in supply of potassium. Levels of organic matter are very low (<1.0 percent), and frequently less than 0.5 percent in a majority (75 to 80 percent) of soils. Organic matter levels continue to decline due to limited or no recycling of organic residues, intensive cropping activities with heavy reliance on chemical fertilizers as well as limited use of organic manures of plant or animal origin.

In Sindh, soil conditions and agronomic practices inducing micronutrient deficiencies in plants include: alkaline soil pH; soil calcareousness; low soil organic matter; micronutrient mining with intensive cropping; use of micronutrient-free N, P and K fertilizers; decreased use of organic manures; removal of plant residues from soil almost after every crop; cultivation of marginal/light textured soils; and electro-chemical changes in flooded rice.

Irrigation Systems

The irrigation system in Sindh has been described in detail (see Chapter 4: Water

Resources). The yearly average water availability in the province, computed from the data from year 1970 to 1997, is 45 million acre feet (MAF). Water withdrawal data for the last five years (Table 5.4), shows decreasing availability of water. This is the result of drought conditions prevalent over the past three years, whereby the availability was short by 35 to 50 percent. Area planted with various *Kharif* and *Rabi* crops in the year 2001-2002, and their water requirements are given in Tables 1 and 2 in **Appendix 5.1: Water Requirement for Crops in Sindh**. The total water requirement is based on the estimated area under *Kharif* and *Rabi* crops as reported by Sindh Agriculture Extension and the previously determined/approved data for each crop in acre-inches. This requirement works out to 17.401 MAF water at the field during *Kharif*, and 8.532 MAF during *Rabi*.

Crop Varieties

Table 5.5 gives details regarding the production of major crops in Sindh.

A number of crop varieties have been developed by agricultural research institutes

Table 5.5: Area, Production and Yield of Major Crops in Sindh during the Past 20 Years (1980-81 to 1999-2000)

Year	Five-year average		
	Area (Million ha)	Production* (Million tonnes)	Yield (T/ha)
Wheat			
1980-81 to 1984-85	1.02	2.02	1.98
1985-86 to 1989-90	1.04	2.21	2.13
1990-91 to 1994-95	1.08	2.30	2.14
1995-96 to 1999-00	1.12	2.63	2.34
Percent change over 1980-81	(+) 11.1	(+) 54.3	(+) 38.1
2000-01	0.81	2.23	2.75
2001-02	0.88	2.10	2.40
Percent change over 1999-2000	(-) 23.5	(-) 30.0	(-) 8.5
Cotton			
1980-81 to 1984-85	0.64	1.45	0.38
1985-86 to 1989-90	0.60	1.27	0.36
1990-91 to 1994-95	0.49	1.23	0.43
1995-96 to 1999-00	0.60	2.19	0.62
Percent change over 1980-81	(+) 5.8	(+) 69.0	(+) 59.9
2000-01	0.52	2.14	0.70
2001-02	0.55	2.44	0.76
Percent change over 1999-00	(-) 13.6	(+) 2.8	(+) 19.0
Rice			
1980-81 to 1984-85	0.72	1.50	2.08
1985-86 to 1989-90	0.67	1.39	2.06
1990-91 to 1994-95	0.65	1.51	2.33
1995-96 to 1999-00	0.69	1.91	2.79
Percent change over 1980-81	(-) 9.6	(+) 37.0	(+) 51.6
2000-01	0.54	1.68	3.11
2001-02	0.46	1.16	2.51
Percent change over 1999-2000	(-) 33.2	(-) 45.41	(-) 18.2
Sugarcane			
1980-81 to 1984-85	0.17	6.96	41.0
1985-86 to 1989-90	0.21	10.10	47.4
1990-91 to 1994-95	0.25	13.87	54.5
1995-96 to 1999-00	0.25	14.84	58.5
Percent change over 1980-81	(+) 69.6	(+) 185.4	(+) 68.5
2000-01	0.24	12.05	45.4
2001-02	0.24	11.42	47.4
Percent change over 1999-2000	(+) 4.4	(-) 20.1	(-) 23.5

* Cotton production is expressed as million bales of lint and cotton yield means lint yield.

Source 1. Agriculture Statistics of Pakistan (2000-01)
2. Sindh Agriculture Extension, Hyderabad

and released by the Provincial Seed Council from time to time. A listing of the varieties of cotton (13), wheat (11), rice (13) and sugarcane (2) released since 1970's is given in **Appendix 5.2: Crop Varieties Released in Sindh by the Provincial Seed Council up to 2002**. It is impressive to see new crop varieties being released after every two to three years. However, it is a matter of concern that most of these varieties did not get the acceptance of the farming community. In practice, there are only a couple of varieties of each crop that are common with the growers. In case of wheat crops, TJ-83, Sarsabz, Kiran-95 and Inqlab (Punjab-based variety) are in demand. For rice crops, IRRI-6 is the most common variety. A significant recent development is the introduction of *Basmati* rice as a result of water scarcity. In the case of sugarcane, some of the commonly grown varieties such as BL-4 and PR-1000 and a recently developed variety Thatta-10 have not as yet been officially approved.

Plant Fertilizer and Pesticide Quality Controls

Fertilizer data for Sindh shows that nitrogen use increased by 59 percent from 0.323 to 0.515 million tonnes, and phosphorus by 92 percent from 0.077 to 0.148 million tonnes during 1990-1991 to 2000-2001. During the same period, the use of potash has shown a variable trend with a decline from nine to four thousand tonnes. The average use of fertilizer in 2000-01 was 161 kg/ha, which includes 124 kg/ha nitrogen, 36 kg/ha phosphorus and 1 kg/ha potash. For the same year, the average use for the entire country was 135 kg/ha, which comprises of 103 kg/ha nitrogen, 31 kg/ha

phosphorus and 1 kg/ha potash. The rate of fertilizer use in Sindh is relatively higher than the other provinces.

Meanwhile, micro-nutrient studies in Sindh have established that zinc is the most deficient micronutrient and zinc fertilization is recommended for rice. Studies on banana have also indicated zinc as a deficient micronutrient. Similarly, cotton has shown response to application of boron. Most of the micronutrient research is limited to field crops and no work has been done on fruit trees. Further work is necessary to clearly establish the nature and extent of micronutrient deficiency problems, crops affected by these deficiencies and the cost-benefit analysis of micronutrient fertilization.

The Directorate of Plant Protection, Agriculture Extension, Sindh, is responsible for quality control measures under the Sindh Fertilizer Control Act. Authorized officers of Agriculture Extension have the mandate to regularly sample the fertilizers from markets and have their quality ascertained from the officially recognized laboratory of the Agriculture Chemist (Soil Fertility) at Tandojam. The number of fertilizer samples analysed and declared unfit during the past three years is given in Table 5.6. Public concern about the marketing of substandard and adulterated fertilizers is growing.

Plant pests are managed primarily by using pesticides. Table 5.7 gives the details of the types and quantities used. A major part of the pesticides is used for controlling pests on cotton, fruits, vegetables, and rice. The private sector has played a major role in promoting the use of pesticides with aggressive media campaigns on television and radio that have

Table 5.6: Progress of Fertilizer quality control measures during three years (2000-2002)

Activity	Year 2000	Year 2001	Year 2002
Samples drawn	433	267	328
Samples found unfit	63	59	31
F.I.R. lodged	55	42	07
No. of cases challenged	55	42	12
Total cases decided	29	21	04

Source: Directorate General, Agriculture Extension Sindh

Table 5.7: Quantity of Pesticides sold in Sindh during 1996-97 to 2000-2001 (in Million tonnes)

Pesticide	1996-97	1997-98	1999-00	2000-01
Chlorinated Hydrocarbons	734.09	1061.63	876.47	362.766
Carbamates	331.63	317.48	548.87	508.522
Phosphate	5487.70	5006.59	2305.07	1138.302
Weedicides	131.87	175.65	102.71	133.940
Rodenticides	21.17	34.79	----	----
Pyrethroids	406.86	670.46	534.14	478.809
Soil insecticides	28.40	53.25	---	----
Fungicides	322.81	390.32	132.703	149.880
Others	815.20	628.38	320.09	----
Total	8279.73	8338.55	4820.05	2772.219

Source: 1. Directorate of Agriculture Extension Sindh, Hyderabad
2. Development Statistics of Sindh 2001

helped to convince and motivate farmers to use them, but despite the sharp increase in pesticide use, the problems have not been solved. On the contrary, the excessive and indiscriminate use of broad-spectrum chemicals has led to many pest outbreaks and has damaged human health and the environment. It has also disturbed the agro-ecosystem and killed non-target bio-control agents and environment friendly organisms including birds. Such a disturbance in the agro-ecosystem has induced pest resurgence and increased the resistance in the naturally occurring pest populations. The populations of natural enemies in cotton growing areas have declined as much as 90 percent in the last decade³.

Moreover, pesticides poisoning affects an increasing number of people every year and thousands of women cotton harvesters and their unborn children are adversely affected. A recent study reveals that the use of pesticides has caused contamination of soil and water, residues in the food chain and has badly affected the health of farm workers⁴.

Monitoring of the quality of pesticides is the responsibility of Sindh Agriculture Extension. Under the provisions of the Agricultural Pesticide Ordinance, 1971, inspectors are

authorized to draw samples of pesticides and send them to the government analyst for testing. The number of samples analysed during the past three years and their status data is given in Table 5.8. This is the area of major public concern.

THE ROLE OF GOVERNMENT BODIES

The Agriculture Department, Government of Sindh looks after the requirements of the agriculture sector in the province. The three wings of the Agriculture Department are Agriculture Research, Agriculture Extension, and Agricultural Engineering & Water Management. Each wing is headed by a Director General, who is supported by a Director and their staff in discharging the responsibilities associated with each wing. In addition, the Sindh Seed Corporation, headed by the Managing Director and the Cane Commissioner, also constitute important components of the Agriculture Department.

Agricultural research in Sindh started with the establishment of the Agriculture Research Station at Sakrand in 1926. After the opening of

3. Hasnain 1999

4. Food and Agriculture Organisation

Table 5.8: Progress of Pesticide Quality Control Measures during 2000-2002

Activity	Year 2000	Year 2001	Year 2002
Samples drawn	1036	618	626
Samples analyzed	955	618	617
Samples found unfit	81	71	116
F.I.R. lodged	76	45	29
No. of cases challaned	63	11	12
Total cases decided	36	04	07

Source: Directorate General, Agriculture Extension Sindh

Sukkur barrage in 1932, the need for more trained labour was realized and an Agriculture College was established at Sakrand in 1939-40. During 1955, the Sakrand set up was shifted to Tandojam, and in 1962, a full-fledged Agriculture Research Institute was established there.

Between 1973 and 1991, the provincial Agriculture Department established four additional institutes of agriculture research. Besides this, district soil and water testing laboratories were also established in 12 districts under the administrative control of the Agriculture Research Institute, Tandojam. A director heads each institute. In view of the increasing number of institutes and their specific management requirements, a post of Director General, Agriculture Research Sindh, Hyderabad (later shifted to Tandojam) was created and started working from April 1987 so as to have centralised administrative and financial control and to coordinate research work in Sindh.

Five important research institutions and soil testing laboratories that now work under the Director General are: Agriculture Research Institute (ARI), Tandojam (District Hyderabad); Rice Research Institute (RRI), Dokri (District Larkana); Sindh Horticulture Research Institute (SHRI), Mirpurkhas; Wheat Research Institute (WRI), Sakrand (District Nawabshah); Quid-e-Awam Agriculture Research Institute (QAARI), Naudero (District Larkana); and the District Soil and Water Testing Laboratories at Thatta, Badin, Karachi, Mirpurkhas, Sanghar, Nawabshah, Naushero Feroze, Dadu, Larkana, Shikarpur, Sukkur and Jacobabad. The central laboratory at Tandojam provides support to all

district laboratories. These laboratories were established in 1983-84 to provide facilities of soil, water, and fertilizer sample analysis and also for advisory services to the farmers regarding efficient use of fertilizers. In order to take this service to the doorstep of farmers, nine Mobile Soil and Water Testing Laboratories were added in 1993-94.

The five research institutions have a total of 477 research scientists working in them, of which nine hold PhDs. The yearly non-development research budget has increased from Rs. 62.15 million in 1991-92 to Rs 194.1 million in 2001-02. Forty-seven percent of this went to staff salaries.

The operational budget constituted 13.9 percent of the budget in 1991-92, which increased to a maximum of 23.8 percent in 1994-95, and gradually reduced thereafter to only 6.53 percent in 2001-02. The development budget also registered a tremendous decrease from Rs. 40 million in 1993-94 to only Rs. 4.77 million in 2000-01. This was followed by its increase to Rs. 13.72 million in 2001-02.

The Pakistan Agricultural Research Council, Islamabad, extends support to the provinces through nationally coordinated research programmes. The budgetary provision for these programmes was Rs. 2.4 million for Sindh in the year 1999-00. There are also a number of agriculture related federal research institutions in Sindh. These include: the Nuclear Institute of Agriculture (NIA), Tandojam; Cotton Research Institute, Sakrand (CRIS); Drainage Research Centre (DRC), Tandojam; and Sugarcane Research Institute, Thatta.



Sunflower Crop, in full bloom

Private sector organizations such as fertilizer and pesticide companies, sugarcane industries, and the farming communities also make a contribution to the research and development efforts of the public sector, through programmes such as the development programme of Habib Sugar Mills, Nawabshah and the recently established Sugarcane Research Institute at Dewan Sugar Mills, Thatta.

Sindh Agriculture Extension

The extension wing of the Provincial Agriculture Department is responsible for the introduction and dissemination of improved crop production technologies and crop varieties, fertilizers, pesticides, weedicides, and farm machinery, and for the collection of crop statistics. It also aims to provide information to the growers on issues such as the insect pest outbreaks and the adulteration of pesticides and fertilizers. Implementation of various acts/laws such as Cotton Control Act, Agriculture Pesticides Ordinance, Sindh Fertilizer Control Act and Agriculture Produce Market Act is also the responsibility of agriculture extension.

After the devolution of agriculture extension services to district governments in 2001, the

organizational set up has undergone some changes. Instead of ten, there are now five directorates. These are: Coordination, Plant Protection, Training, Agriculture Information, and Agriculture Marketing and one Joint Director Agriculture Statistics.

The Director Coordination is responsible for coordination with all the components of agriculture extension including technical planning and implementation, supervision of data collection, preparation of agriculture statistics and looking after various demonstration farms (seed farms and adaptive research farms). The Joint Director, Agriculture Statistics, works in close coordination with the Director Coordination. He is responsible for the collection and preparation of crop yield and production estimates for the province through sampling techniques.

The Directorate of Plant Protection is responsible for registration and licensing of fertilizer and pesticide dealers, quality control of pesticides and fertilizers, suggesting suitable amendments in Agricultural Pesticides and Fertilizer related act/rules, coordination with district governments regarding enforcement of different acts/rules related to

pesticides and fertilizers and monitoring of pest problems.

Training activities for Sindh Agriculture Extension are provided by two Agricultural Training Institutes (ATI); one at Jacobabad and the other at Sakrand. From 1996, Female Field Assistants have also been enrolled at ATI, Sakrand.

The Directorate of Agricultural Marketing, under the provisions of Agricultural Produce Market (APM) Act 1939 and other related provisions, help regulate the purchase and sale of agriculture produce (while protecting the interest of the growers) and the establishment of agricultural produce markets in the province.

The budget for agriculture extension has increased by only 22 percent in 10 years, from Rs. 235.38 million in 1992-93 to Rs. 288.43

million in 2001-02, while the salary component has increased by 144 percent in the same period. This is reflected in the proportion of the operation and maintenance (O&M) budget, which reduced from 53.5 percent in 1992-93 to only 6.9 percent in 2001-02. This in itself sums up the problems the extension process faces in Sindh.

Private sector agencies dealing with seed, fertilizer, pesticides, and agricultural machinery, along with some NGO's, are sharing agriculture extension services with the public sector, particularly where their business interests can be served. Private sector companies carry out aggressive marketing campaigns including high profile farmer meetings, village level meetings, demonstrations, field days and publicity through electronic and print media to ensure farmer support. The government needs to reassert its priorities and, at the very least, regulate such

Table 5.9: Comparison of Available Seed with Percentage of Total Capacity of SSC and Seed Requirement

Year	Processed/ Available Seed (Metric Tonnes)	Capacity (Metric Tonnes)	Percentage Capacity Utilized	20 percent Seed Requirement of Sindh	Achievement (percent of Total Requirement)
Wheat Seed					
1997	2,501.32	10000	25.00	19880	2.52
1998	3,208.40	10000	32.00	19880	3.23
1999	4,075.36	10000	40.75	19880	4.10
2000	3,567.08	10000	35.67	22216	3.21
2001	3,223.60	10000	32.23	22800	2.83
Paddy Seed					
1997	863.60	1600	53.97	2000	8.64
1998	147.68	1600	9.23	2000	1.48
1999	461.80	1600	28.86	2000	4.62
2000	313.20	1600	19.57	1800	3.48
2001	105.72	1600	6.60	1800	1.17
Cotton Seed					
1997	740.00	–	–	9000	1.64
1998	860.00	–	–	9000	1.91
1999	1,230.00	–	–	9000	2.73
2000	879.00	–	–	9000	1.95
2001	578.16	–	–	7546	1.53

Source: Sindh Seed Corporation, Hyderabad



Tackling disease and pests: Spray on Cotton crop

commercial campaigns that may not be in the best interests of the farming community.

Sindh Seed Corporation

The Sindh Seed Corporation (SSC) was established by the government in 1983 to produce, multiply, procure, process and distribute genetically pure and certified seed to the growers to enhance crop production in Sindh. The SSC has an area of 5,945 hectares comprising six basic seed farms at Sakrand (372 ha), Setharja (1041 ha), Ruk (107 ha), Ghotki (1417 ha), Lakhi (110 ha) and Lodhra (2,598 ha). The area is sufficient for production of basic seeds of various crops required in the province. So far the basic seed production from these farms has not been able to meet the needs of the problems. Major problems faced by these farms include lack of cooperation by tenants with SSC staff to carry out various technical procedures, scarcity of irrigation water, large portion of salt-affected soils and general management constraints.

A Seed Processing Plant complex was also set up at Sakrand in 1980-81. It consists of a Cereal Seed Processing Plant, Cotton Ginning

Plant, and Cotton Delinting Plant. It has a total processing/ginning capacity of 19,400 metric tonnes of wheat, 2,800 metric tonnes of paddy and 6,600 metric tonnes of cotton. The plant even if fully functional cannot meet even a fraction of the wheat and cotton seed requirements of the province. The seriousness of the problem is illustrated in Table 5.9 below. Thus there is a tremendous scope for development of seed industry in Sindh through private sector investment.

In its meeting held in June 2001 the Sindh Cabinet decided to close the SSC by June 2002. However, due to pressure from all stakeholders (the federal government and the private sector), the Sindh government is reconsidering its decision. In addition, in October 2001 the government established the Foundation Seed Cell (FSC), under the Director General Agriculture Research Sindh, for basic seed production.

Agricultural Education and Research

Sindh Agriculture University (SAU) Tandojam is the only institution providing agriculture

related education in the province. It produces graduates and post-graduates in Agriculture Extension, Agriculture Research, Agriculture Engineering, Water Management and Livestock wings of the Agriculture Department. The University has a current enrolment of up to 4,000 students in bachelors, masters and doctoral degree programmes. In recent years, the annual enrolment has reduced to around 200 students per year against the intake capacity of 800 students per year. The University also has a highly qualified teaching faculty of 220 of which 25 percent possess Ph.D. degrees. The Z.A. Bhutto Agriculture College at Dokri is a constituent college of SAU Tandojam and offers bachelors degree in various disciplines of agriculture.

In the light of new developments all over the world, particularly in developing South Asian countries, curriculum appraisals are needed in order to incorporate a more historically informed critique of agricultural practices before and after the British came to India. A better understanding of the so called Green Revolution in this region and its detrimental affects also needs to be incorporated in the curriculum and in research organisations.

ISSUES, OPTIONS AND INTERVENTIONS

Land Degradation

A major issue related to land degradation is the depletion of soil fertility and organic matter. To arrest the decline in soil organic matter, the use of organic sources of plant and animal origin need to be popularised. Whenever possible, crop residue must be recycled and organic manures included as a necessary input on a periodic basis. The inclusion of legumes and green manure crops should also be given a place in crop rotation.

The sugar industry produces a large quantity of sugarcane filter cake every year, which is a rich source of organic matter with macro and micronutrients. It is gaining popularity with the farming community as a source of organic

matter providing plant nutrients and improving soil conditions.

Soil salinity and waterlogging constitute a major problem to agriculture in Sindh. Past attempts to tackle this problem have not been very successful and consistent research effort and its application to field situations is essential to help the farming community. At present, soil salinity research is limited in the provincial agriculture research system for reasons of limitations of staff, equipment, funding and mobility.

Efficient Use of Irrigation Water

Excessive and inefficient use of water is also a major problem confronting the agriculture sector. This issue can be tackled by the lining of water courses to prevent seepage and loss; by using laser levelling technology to level fields so that excessive water required to reach higher areas can be curtailed; replacing flat basin irrigation methods--now in use--by bed planting; introducing higher efficiency irrigation systems such as drip, truckle and sprinkler; and by preventing excessive pumping out of groundwater which is depleting freshwater and replacing it with water from the deeper saline aquifer. Examples of all the above interventions are available in Sindh.

Cropping Patterns to Suit Water Availability

In order to meet the challenge of water scarcity, the government decided that low delta crops such as sugarbeet, cotton, oil seeds should replace the high delta crops like sugarcane and rice in accordance with the soil and climatic conditions of the area and the place of the alternate crops in economy of the country. This effort should continue but the marketability and economic feasibility of the produce for the farmer has to be studied and promoted.

Varietal Development Programme

High yielding crop varieties of desired characteristics are an essential need of the



Onion Seed

farming community and for the agriculture progress of Sindh. A number of wheat, cotton and rice varieties have been released in the province but the level of adoption by the farming community is very low except for some wheat varieties. The seed multiplication from plant breeders' seed to certified seed and its supply to the farmers is considered to be the weakest link and thus a barrier in the adoption of new practices. Moreover, the newly released varieties do not often match the farmer's circumstances which results in non-adoption of new varieties by the farming community. Plant breeding programmes should, therefore, be tailored to farmer's needs, in addition to an assured supply of seed.

Adulterated and Substandard Pesticides and Fertilizers

For obtaining desired yields from the use of fertilizers and pesticides, the supply of unadulterated and quality pesticides and fertilizers is essential. The Agriculture Pesticides Ordinance (APO) and Fertilizer Control Act should be revised to remove flaws in the laws regulating pesticide and fertilizer

industries in the country and to increase the punishment and fine to those selling substandard and adulterated products. In addition, the existing laboratories of Pesticide Quality Control at Hyderabad and Rohri should be strengthened through the provision of necessary equipment and staff trainings.

Management of Plant Viruses

Cotton Leaf Curl Virus (CLCV) and Banana Bunchy Top Virus (BBTV) have resulted in major crop damage. For the CLCV, the solution lies in evolving and introducing CLCV resistant varieties. Long-term solution of the BBTV problem lies in the use of virus-free banana seed for all banana plantations along with necessary regulatory steps to avoid virus infection from the neighbouring virus-infected banana fields. Unfortunately, there is no trained plant virologist in Sindh and the facilities for research on plant viruses are also lacking. The issue may be addressed by staff trainings and strengthening of research activities by establishing a Plant Virology Research Section/Centre.

Agriculture Research Management

A comprehensive approach is required to address the issues constraining the progress of agriculture research in the province. This includes substantial restructuring of the agriculture research system along with a major shift in policies governing the system. These elements include a reorientation of research priorities. For instance, the identification of indigenous varieties of seeds that are less water intensive, the development of organic fertilisers and pesticides, and the re-introduction of crop rotation to improve soil quality.

New priorities include: human resource development and a respect for merit; restructuring of agricultural research so as to modernize it and relate it to current needs; the offering of attractive career opportunities to scientists and incentives for quality research; and an increased research budget. These standards are fundamental to the development of research in agriculture.

Large Yield Gap and High Cost of Production

Crop yields in Sindh are relatively better than in the other provinces, yet there is a large yield gap which needs to be narrowed down through appropriate interventions. Improving the marketing environment and an integrated approach towards agriculture education as well as research and extension can help evolve new interventions that can reduce the yield gap.

The increasing cost of various inputs such as seed, fertilizer, pesticides, labour, petrol, oil and lubricants (POL) for tractors/machinery, increases the cost of production. Recently, the increased reliance on tube well water has highly inflated the cost of production and reduced profit margins. Technologies with high output-input ratios are therefore required to decrease the cost of production and increase the profitability of farmers while increasing crop production levels. Some of these measures include: improving land preparation and planting methods; providing for efficient use of irrigation water such as laser land levelling, bed furrow planting, use of zero



Sindh Agriculture Information Department, Hyderabad

Wheat Collection Centres facilitate farmers in selling the output from their crops

tillage drills for planting wheat after rice; quality seeds of promising crop varieties; evaluation and introduction of efficient fertilization techniques such as foliar fertilization and fertigation techniques; adoption of composting techniques for soil improvement and for organic recycling and enhancing the efficiency of manures; application of biofertilizers; mulching in fruit trees to improve the soil and the physical, chemical and biological environment for crop nutrition; rational use of pesticides through integrated pest management; and post-harvest techniques to avoid crop losses and value-addition to the crop produce.

The Participation of Women

Women play a major role in agricultural production and livestock raising. Women's participation is particularly high in the production of cotton, rice, pulses and vegetables. The measures proposed below are meant to recognize the role of women and to improve their skills: training of female agriculture extension workers in order to approach women farmers more easily;

improving the skills and efficiency of rural women through appropriate technology; and a range of extension services.

The traditional knowledge systems developed by women agriculturalists over centuries of tending to common ailments of livestock, the use of organic pesticides, and water harvesting systems needs to be collected and codified.

Crop Estimation Process

Crop estimation is a vital part of the agricultural sector. It is essential that reliable crop estimates (area, production and yield) are available to study the trends of growth and to formulate policies and plans for the future. However, the reliability of the crop estimation process in Sindh has been questioned at various forums.

As a result of decentralization in 2001, the staff responsible for crop estimation has been placed under the control of the district government. This is seriously hampering the work of crop estimation in the province. There are also problems of mobility of staff and the old sampling frame, which does not take into account the change in the crops and cropped area in the *deh* (village) of the province in the last 30 years.

For the crop estimates to be reliable, old sampling frames need to be replaced and the crop estimation staff needs to be withdrawn from district governments and placed under an independent Statistical Cell and provided with periodic training, necessary mobility, and required equipment.

STAKEHOLDERS

This includes functionaries of the federal and the Sindh government dealing with agriculture development in the province, public institutions for Agriculture Research and Extension, Agriculture Engineering and Water Management, Sindh Agriculture University, Pakistan Agricultural Research Council, the sugar industry, the farming community, NGOs, and the private sector related to agriculture, and marketing agencies. The role of these stakeholders has been described in the sections above.



Sugarcane harvest by women

FUTURE ACTION

The following actions are required to address the problems faced by the agriculture sector in Sindh.

- Research development and extension in:
 - Land Resources Management
 - Efficient Use of Irrigation Water
 - Farm Mechanization
 - Crop Production
 - Plant Protection
 - Horticulture
 - Post Harvest Technology and Quality Assurance
 - Marketing of Agricultural Produce
- The strengthening and/or development of:
 - Support systems such as the District Soil and Water Testing Laboratories, Pesticide Quality Testing Laboratories at Hyderabad and Rohri, and the new laboratories at Mirpurkhas and Larkana
 - Agriculture Extension
 - Agriculture Research

- Social sciences at academic institutions to understand the implications of current agricultural practice on output and to develop strategies to meet the challenges of WTO and other international agreements
- Coordination between the NGOs, the private sector, farming communities, public sector institutions and the academia

The Ten Year Perspective Plan (2001-2011) of agriculture development in Pakistan covers the majority of options presented above. Accordingly, the main objectives of agriculture development in the next decade are: to achieve self-reliance in agricultural commodities, ensure food security, provide surplus for export of high value crops, fruits and vegetables, promote import substitution, and improve management practices. The province of Sindh is part of the development programme and the provincial Annual Development Plan (ADP) and research and development (R&D) plans of the province are meant to address the issues confronting agriculture in Sindh.



CHAPTER 6

Freshwater and Marine Fisheries

Fisheries play an important role in the national economy and are considered an important source of livelihood for the inland fishermen and coastal inhabitants. During the period July-March 2003-04, total fish production was estimated at 630,000 metric tonnes of which 452,000 metric tonnes was produced by the marine sector and 178,000 metric tonnes by inland fisheries. About 50 percent of this was produced by Sindh. An estimated 101,256 metric tonnes of fish and fishery products, valued at Rs. 7.9 billion, was exported during that period. The total number of people engaged in this sector during 2003-04 was estimated at 395,000. Of this, 125,000 people (31.6 percent) were engaged in the marine sector and 270,000 people (68.4 percent) in inland fisheries. In comparison, the total number of people engaged in this sector during 2000-01 was estimated at 360,000.



In general, the consumption of fish in Pakistan is very low (less than 2 kg per capita), with Sindh consuming the highest among the provinces at 4.25 kg per person per year, which is still quite low. The consumption increased as a result of the conversion of fishing from subsistence to a commercial activity in the 1960s with the creation of the Fisheries Department by the government and the Food and Agriculture Organization (FAO). This intervention coincided with the development of the poultry industry in Pakistan, particularly in Karachi. The poultry industry depended heavily on fish feed and factory owners along with the Fisheries Department offered loans for the mechanization of boats and the purchase of nets².

PRESENT CONSTRAINTS

Today, the threat of overfishing, degradation of the ecosystem and unsustainable exploitation of marine resources is a growing concern, along with an alarming rise in pollution levels in fishing waters. These are major factors causing depletion of the coastal and deep-sea fish stock.

The Karachi Fish Harbour (KFH) is the only harbour equipped for the adequate landing and processing of export. Balochistan, with a longer coastline, also transports its harvest to Karachi for processing and export, since the facilities in Balochistan are inadequate. The KFH is heavily congested, with over 2,500 fishing trawlers causing acute environmental problems and degradation of the marine ecosystem. These factors result in heavy post-harvest losses.

The fishing industry in Sindh operates in inland waters, within 12 nautical miles off the coast. The area for fishing beyond the 12 nautical mile range is out of reach for local fishermen since they do not have the right type of crafts to explore it. The Deep Sea Fishing zone beyond 35 and up to 200 nautical miles has been exploited by foreign vessels under a joint programme between them and the Government of Pakistan. Unfortunately, this has been done without any transfer of technology to Pakistan

or substantial revenue earning for the country. The authorities have so far been unsuccessful in checking or preventing the over exploitation of biomass or the stopping of trans-shipment of the catch in the high seas. The exploitation of this zone has been carried out without any fresh assessment and fish stock surveys in Pakistan's territorial waters. Resource depletion as a result of overfishing and pollution hazards also remains unrecorded. The last marine stock survey was carried out by FAO in 1985, and since then no fresh survey has been undertaken. Foreign vessels have been poaching on the turf of local fishermen, causing unrest among them and degrading the marine ecosystem by pushing the resources beyond the maximum sustainable yield (MSY).

Out of the 1,050 km coastline of Pakistan, about 350 km lies in Sindh province and is considered to be the most productive. It comprises of a much broader continental shelf, extending 110 km from the coast, which is indented by a number of creeks in the Indus Delta. The continental shelf of Sindh, an area of prime importance for the fisheries of Pakistan, has been subject to overexploitation. Over 16,000 fishing boats of all categories are engaged in extensive fishing along the coast as shown in Table 6.1.

Fishing in Pakistan has so far been dependent on natural sources. There is no move for diversification of resources to culture fisheries and reduce the pressure on wild stock. A number of development projects were executed in the fisheries sector without meeting the desired goals. As a result, the sector is in a debt of over 120 million dollars, in foreign loans taken mainly for Sindh.

The Sindh Fisheries Department gained the status of a separate directorate in 1974. On the recommendation of ADB, the post of director general was created in 1989. Since then, the Department of Fisheries, Sindh has been striving hard to manage the fisheries resources.

The province holds a premier position in the fisheries sector of Pakistan. It commands almost 100 percent of brackish, 65 percent of

1. Economic Survey of Pakistan 2000-2001
2. Hasan, Arif. 2002. *The Unplanned Revolution*. City Press, Karachi

Table 6.1: Trends in Types of Fishing Crafts

	1960	1970	1980	1985	1990	1993	1995	1998
Trawlers	86	443	1296	1631	2000	2028	2252	2522
Gill netters	160	707	909	1249	2063	2369	2812	3398
Mechanised Sail boats	0	0	1333	4417	5972	6524	7256	7945
Sail boats	3061	5343	5859	3112	5478	5793	5918	6324

Source: Handbook of Fisheries Statistics of Pakistan; unpublished data

freshwater, and 71 percent of marine fish resources of the entire country. The exploitation of inland and marine resources (up to 12 nautical miles) in a judicious and sustainable manner to ensure conservation and development has been the responsibility of the Fisheries Department of Sindh. These resources constitute about 350 species of marine, over 120 species of freshwater and 15 species of commercially important marine shrimp³. (Details regarding the main fisheries of commercial value are given in **Appendix - 6.1: Fish Species of the Indus Basin.**) In the year 2000, the Directorate of Fisheries Sindh bifurcated into the Director of Fisheries Inland, stationed at Hyderabad and Director of Fisheries Research and Development, stationed at Karachi.

Fishing rights on about 1202 public waters in Sindh are given on a yearly lease through an open auction and licensing system. The local fishermen are allowed to bid and participate in it. Sindh Fisheries Ordinance, 1980 governs fishing.

Besides the above fishing waters, there are five main waters where fishing rights are given through individual licensing to fishermen. These are: Manchar Lake in Dadu District, Lake Bakar in Sanghar district (now Chhotiari reservoir), Sindh Dhoro in Jacobabad district and River Indus below Kotri Barrage. There is no consistent policy regarding this and it is always open to changes by vested interests and political influences.

The major inland and coastal fishing zones in Sindh are shown on Map 6.1.

The main constraints to the fish farming industry are the absence of credit facilities,

water shortages, lack of supply of quality fish seed and technical expertise. Mismanagement in the fisheries sector is the main cause of most of the problems and constraints facing the fishing industry. This mismanagement has resulted in the misuse of foreign funds for this sector.

Equipment procured during the execution of development projects has not been properly utilized and more often than not has been destroyed due to misuse. For instance, the Korangi Fish Harbour constructed for berthing vessels and setting up of industries for deep-sea catch remains inoperative since its completion in 1995.

Various infrastructure facilities developed by the State are either not operational or have been abandoned. These include: the Pilot Shrimp Farm Garho; Fishermen Marine Training School; Fish Farmers Training and Extension Centres of Upper and Lower Sindh; Carp Fry Centres at Kandkot, Mandodero (Sukkur) and Hosri (Hyderabad).

Beds of bivalve shells, particularly of oysters, are also suffering from the ecological changes in the Indus Delta due to the reduced inflow of Indus water below Kotri and also because of silting and marine pollution.

As mentioned earlier, fish production and fish quality have suffered considerably because of lack of landing facilities along the coastline. A majority of fishing crafts unload their harvest on the beaches where considerable spoilage of fish occurs, which also pollutes the physical environment of the coastal regions.

3. Fisheries Department, Government of Sindh



Unhygienic handling of fish at harbour

EMERGING TRENDS

The expansion and modernization of the fish industry has brought about permanent social, economic and physical changes⁴. The nuclear family has evolved, as opposed to the age-old joint family set-up and people previously engaged in agriculture and forestry have taken up fishing as their occupation on seeing the economic benefits of this industry. The subsistence barter economy of these activities has now been replaced by a cash economy. However, the economic benefits are counter-balanced by the high cost of living and the debts that the fishing communities have to bear.

Fishing settlements have expanded, but the physical and social infrastructure they require, has yet to be developed. Activities such as loading, unloading, packaging and storage create considerable solid waste of an inorganic nature but due to the absence of sorting and removal of garbage, the beaches remain littered with plastic bags, crates, containers, nylon nets and rubber tyres. In the absence of the seasonal ban on fishing by deep sea

trawlers, there is concrete evidence of marine life being depleted.

The boat-building industry has expanded and with it diesel and oil requirements, which are not properly disposed off, resulting in marine pollution. Agriculture and forestry, replaced by fishing, have declined, although people are consuming larger quantities of grain and using more firewood. No new trees are being planted, although the quantity of timber used for making boats has increased. While the fishing community understands the two major environmental issues it faces; denudation of the coastline by trawlers and overtaxing the existing water sources, it is not properly organized to struggle against these concerns or to undertake reforms.

The unsustainable exploitation of fisheries resources, non-adoption of conservation methods and damage to the ecosystem are the reasons for Pakistan's failure to compete in the international market and also for the environmental crisis in this sector. Other reasons are poor hygienic conditions at the

4. Hasan, Arif. 2002. *The Unplanned Revolution*. City Press, Karachi

harbour, landing sites, and at processing units. Only four processing units qualified initially for certification of export when an EU inspection team visited KFH in 1998. At present, the number has gone up to 14 out of over 40 units established in and around KFH.

The revenue earnings for the last five years through auctions of fishing waters in all 13 rural districts of Sindh have not been encouraging. Despite that, there is a hundred to four hundred percent increase in the price of fish in the market. This trend of both diminishing returns and increasing cost of fish in the market is increasing.

The system of leasing out yearly fishing rights to individual contractors who later employ fishermen at an exploitative wage, has not been in the interest of the fishermen and is the cause of low production and damage to the already fragile ecosystem in the wetlands. The lessee (contractor) buying fishing rights on a yearly lease comb out the entire biomass including sub adult and juvenile fish from the waters. Neither the contractor nor the Fisheries Department keeps any record and statistics of fish production and stock of fish. Fishermen often complain of no credit facilities and non-participation in fishing lease auctions. If this process continues, marine life in Sindh will be drastically depleted.

Fish farmers training and extension centres have been established at Mandodero (Sukkur) and Chilya (Thatta) for the promotion of fish farming, extension services, supply of fish seed and technical assistance to fish farmers of upper and lower Sindh. Hatcheries and fish seed supply centres were later established in Badin, Bubak (Dadu) and Larkana from 1995 to 2000. While there is a five to ten percent increase in the number of fish farms in each of the above districts since 1996; where there is an adequate supply of canal water, a number of fish farms have also closed down because of the short supply of Indus water. This trend will continue unless Sindh can get its rightful share of Indus water and unless water management and O&M facilities are improved.

There are about 2400 fishing boats operating in the Indus estuary, catching a variety of fish and shrimp. The annual catch of fish and shrimp



Tahir Qureshi

Shrimps contribute 60 percent of our fishing export

from the creeks of the Indus delta is estimated to be 1000 metric tonnes, but post-harvest losses are incurred due to a lack of infrastructure and poor handling of the catch. Such post-harvest losses are increasing.

There is a consensus among experts that shrimp resources are being over exploited. The catches have already surpassed the MSY of 15,000 million tonnes per year due to unregulated shrimp catching fleet and environmental degradation. A similar fate awaits squids and cuttlefish, the catching of which has increased due to an export demand.

Maritime fisheries, which are of utmost value, have not been upgraded and their status has remained that of a small industry, being practiced on small wooden boats of 1 to 40 gross registered tonnage (GRT). Some 200 to 250 boats of the same size are added every year, congesting the fishing area. It employs around 360,000 illiterate, unskilled and untrained artisan fishermen, operating without the application of any relevant technology. This has serious repercussions for the sustainability of the sector both in commercial and environmental terms.

The Exclusive Economic Zone (EEZ) located 35 to 200 miles off the coast, has been exploited by foreign fishing vessels that take away Pakistan's valuable resources without being brought to the port or being made part of the export process.

The deep-sea fishing policy of 1995 was revised in August 2001 to allow fishing in the EEZ within 20 nautical miles instead of 35. Strict vigilance and a tough punitive regime to safeguard the interests of small fishermen were also proposed but the same old weak surveillance system prevails.

The outlets in Badin that are the main source of shrimp production are now less attractive for auctioneers because of the discharge of untreated toxic effluents from half a dozen sugar mills and other industries in their vicinity. The auctioneers refused to bid for the outlets this year which was a big blow to the Sindh Fisheries Department, which will be deprived of the revenue and the country denied foreign exchange earnings. The non-implementation of National Environmental Quality Standards (NEQS) and the ineffectiveness of Sindh Provincial Department of Fisheries (DoF) and the Environmental Protection Agency (EPA) are endangering the wetlands of this region due to industrial pollution.

The USA threatened to ban the import of Pakistani shrimp unless the protection of the Arabian Sea green turtle is assured by putting a Turtle Excluder Device (TED) in all trawlers for catching shrimp in Pakistani waters. The carrying of the TED was made compulsory for all trawlers catching shrimp when a US team visited Pakistan in January 2000 for physical verification and inspection. US law requires that no American firm import seafood from a country that flaunts this rule. This is a positive trend but the Government of Sindh has yet to develop the means to impose and monitor these conditions.

An annual two-month ban on catching shrimp imposed in accordance with the Sindh Fishery Ordinance 1980 shows that in the last 15 years, the ban was not allowed to be completed except in 1993, when it was enforced for 61 days.

STAKEHOLDERS

Directorate of Fisheries Sindh

The Sindh Fisheries Department gained the status of a separate directorate in 1974 with its headquarter in Karachi. Presently, it is working under the Department of Agriculture, Livestock and Fisheries, Government of Sindh. The development of inland, as well as marine resources up to 12 nautical miles from the coast falls under its jurisdiction. The judicious exploitation and conservation of fish resources has been the responsibility of the Department. In 2000, it was divided into the Director of Fisheries Inland, stationed at Hyderabad and a Director of Fisheries Research and Development, stationed in Karachi.

Marine Fisheries Department, (MFD) Karachi

The MFD was established in 1951 and is headed by a director general with the responsibility of resource assessment and management of marine fisheries activity in Pakistan's EEZ. The responsibilities include the inspection of fish products for export, the publication of national fisheries statistics, implementation of foreign-financed research, and the setting up of development and training projects.

National Institute of Oceanography (NIO)

The National Institute of Oceanography (NIO) is under the Federal Government, Ministry of Science and Technology and is based in Karachi with a portfolio of carrying out resource-oriented research. It is also involved in studying environmental parameters as they affect fish stocks, shrimp culture, and in the collection of baseline oceanographic data.

Centre of Excellence in Marine Biology

The Centre of Excellence in Marine Biology is affiliated with the University of Karachi but is an



Boat houses are still used by the Fishing community in Sindh

autonomous body headed by its director. It is involved in all kinds of marine biology research (including zooplankton, fauna, etc). It has MPhil and PhD students.

Department of Zoology

The Department of Zoology at the University of Karachi has bachelors and masters students doing zoological research. The department has a fisheries section. It serves as a launching pad for people interested in working at the Centre of Excellence in Marine Biology.

Karachi Fisheries Harbour Authority (KFHA)

The Karachi Fish Harbour was established with the assistance of UNDP/FAO in 1959. It comprises of a navigation channel, water basin, fish market, ice plants, processing plants, boat-building yard, and allied facilities. In the late eighties, the KFHA was given a face-lift with financial assistance from the European Economic Community (EEC) and a body, the Karachi Fisheries Harbour Authority (KFHA),

was promulgated through an ordinance in 1984 with the responsibility to run, maintain and operate the KFHA. The KFHA functions under the administrative control of the Department of Agriculture, Livestock and Fisheries, Government of Sindh, to implement the government policies according to the guidelines and recommendations of the EEC.

Since 1999, the KFHA has been under the control of the federal government which has appointed a working Commodore of the Pakistan Navy as its chairman.

Korangi Fisheries Harbour Authority (KoFHA)

The KoFHA was established under Ordinance No. XVI of 1982 for making arrangements for the planning, construction, operation, management and maintenance of Korangi Fisheries Harbour and exploitation of fisheries resources beyond Pakistan's territorial waters. The KoFHA is an autonomous body operating under the Ministry of Food, Agriculture and Livestock, Government of Pakistan.

Fishermen's Cooperative Society (FCS)

Boat owners and traditional fishermen formed this society in 1945 to manage the sale of fish handed by members' vessels, import machinery and gear, and provide welfare services to members. A levy of 6.25 percent of the total value of fish sold at an auction is raised to run the expenses of the FCS.

National Fisheries Development Board (NFDB)

The NFDB is the highest fisheries related government body formed in 2001 by the Chief Executive of Pakistan to formulate and implement fisheries related policies at the national level.

FUTURE ACTION

Fishermen, fish farmers and their communities need to be assisted regarding the extension of credit facilities. They should be encouraged to establish and maintain effective cooperative

societies from village to district level and given credit facilities through government, non-government and donor agencies. These organizations and cooperatives need to be strengthened so that they can pressurise the companies and middlemen to accept the system of deducting commission from the value of a catch rather than purchasing the catch at less than market rates from their creditors⁵.

The district fisheries officers in each district need to maintain data on the statistics of fishing as well as a record of harvest and stock biomass for sustainable exploitation, conservation and stock replenishment.

The use of abandoned infrastructures, sick units and the unproductive hatchery units should be handed over to viable fish farmers to run on a cooperative basis. Infrastructure facilities including roads, electricity and telephone, where possible, should be provided to fish farms.

Gradation of fishing boats and trawlers should be undertaken and reduction in the number of wooden boats operating within 12 miles zone should be carried out.



Saima Pervaiz Baig

Local fisherman operate in inland waters, within 12 nautical miles off the coast

5. Ibid



A bird's eye view of the congested Karachi harbour

Bigger boats should be encouraged, along with steel hull boats with onboard engine and freezing and insulation devices. The wooden boats and small trawlers should be converted for specific fishing functions like squid catching, anchovies and crab fishing, etc. Registration of new boats and issuing of fishing permits should be stopped till the gradation of the existing fishing fleet is completed.

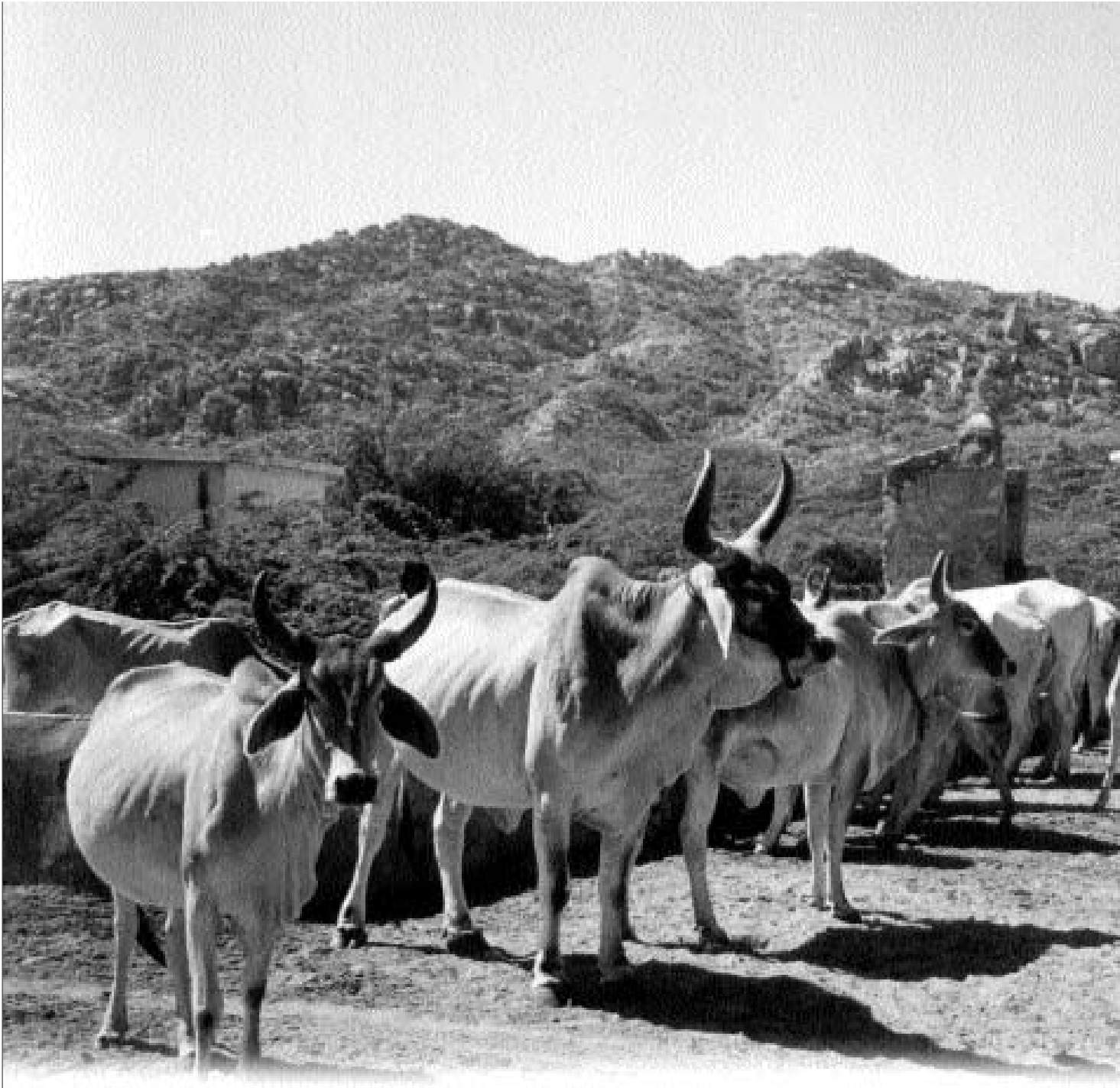
Comprehensive training programmes for fishermen on better methods of fishing, use of gear, conservation and protection of marine ecosystem from overexploitation, harmful fishing nets and pollution should be initiated. These should also include training in post-harvest handling, preservation and transportation of catch, and mending and mending of fishing nets. There is a need to build the confidence of the fishermen by sharing their problems so that training programmes can be more effective.

The two fish harbour authorities, KFHA and the KoFHA, are run by the provincial and federal governments, respectively. The KoFHA can be merged with the KFHA, which has been working under the guidelines of EEC, the main importer of seafood from Pakistan. The KFHA

can then be restructured and run by competent and trained professionals.

The auction of fisheries waters in the provinces needs to be streamlined. The present auctioning of waters on yearly lease has been counter-productive. An independent survey of the 1,202 fishing waters in Sindh and of the lakes, reservoirs, dams and flood control compartments, should be carried out by an independent consulting firm with the involvement of relevant NGOs, fishermen's organisations and the private sector involved in the industry. Suggestions for development, improvements and judicious exploitation under EIA, should be a part of their Terms of Reference (ToR). A joint body of fisheries and irrigation departments of the province and WAPDA can work to coordinate the development and exploitation of these resources.

Joint venture operations with bigger fishing vessels (100 to 250 GRT) should be encouraged with local participation and transfer of fleet. The NEQS and Pakistan Fish Inspection and Quality Control Bill 1997 for maintaining marine environment and hygienic conditions, checking quality, and certification for export needs to be implemented more rigidly.



CHAPTER 7

Livestock and Poultry



A majority of the population of Sindh is directly or indirectly engaged in agriculture and livestock farming. Landless farmers, in particular, depend upon livestock farms for their subsistence where more than 75 percent of the rural population practice livestock farming. The province has a fine breed of livestock which are amongst the finest in the tropical world. There are livestock and agriculture farms both in the private and public sectors with an average area of 4.3 hectares.

Sindh has 25.455 million and 11.861 million heads of livestock and poultry birds respectively. The number of households reporting livestock and poultry is 4.284 million and 0.840 million¹. Details are given in Table 7.1 below.

LIVESTOCK PRODUCTION

The livestock population of the province forms a sizeable proportion of the national livestock population and is distributed throughout the province with marked concentration in irrigated areas.

Over the past five decades, improvement in the performance of breeds and methods of exploitation of their genetic potential has been negligible as reported by national and international scientists. There has been no breakthrough in milk and meat production per animal. Consequently, no genetic change has occurred in highly regarded Red Sindhi and Tharparkar cattle or in the Kundhi buffalo or any other class of livestock as far as its production performance is concerned. The per capita availability of milk in Sindh has reportedly reduced to 14 ounce (oz) from 22 oz, available in 1943. Out of 22 oz available at that time, 16 oz were consumed as raw fluid milk and 6 oz were available for conversion to

important dairy products like butter and *desi ghee* (cooking oil of animal origin). Today, *desi ghee* has become a very rare and costly commodity because of shortage of per capita availability of fluid milk.

Nutritional Status

The 25.455 million heads of livestock in Sindh annually require 12.52 million tonnes of Total Digestible Nutrients (TDN). Similarly, the total yearly requirement of Digestible Protein (DP) is assessed to be 2.05 million tonnes. Against this requirement, the calculated availability of TDN per annum is 4.456 million tonnes and that of DP is 0.56 million tonnes, entailing an annual shortage of 1.47 million tonnes of DP and 5.69 million tonnes of TDN². This demonstrates the situation of livestock nutrition in the province and it can be concluded that livestock remain undernourished and the production of milk and meat per animal is adversely affected. In such a situation, improvement in the genetic potential of livestock is difficult.

Breeding Status

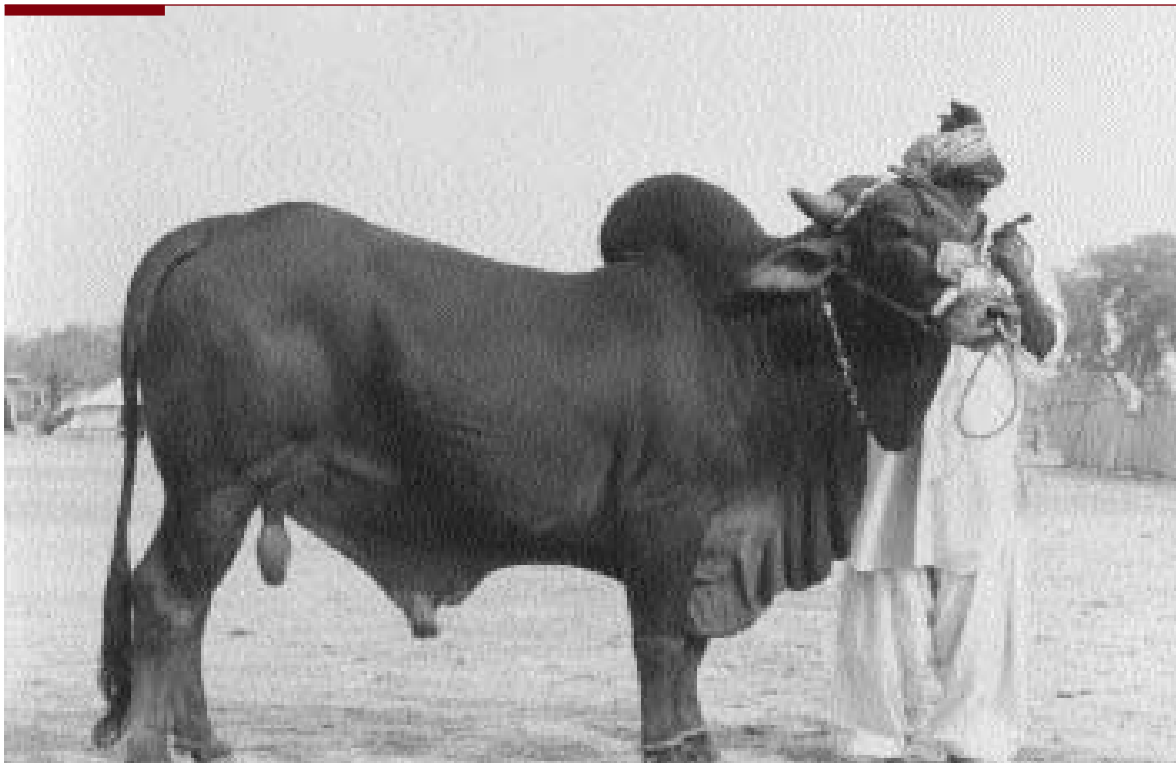
There is a general shortage of purebred stock in the province. According to conservative estimates, there is only ten to fifteen percent

Table 7.1: Livestock and Poultry Population in Sindh

Species	No. of Livestock and Poultry (million)	Percent of National Population	No. of Households Reporting Livestock (million)
Buffaloes	5.615	28	0.988
Cattle	5.404	27	0.898
Goat	9.734	24	0.852
Sheep	3.710	16	0.189
Asses	0.694	19	0.378
Camels	0.225	28	0.924
Mules	0.01	9	0.007
Horses	0.063	19	0.048
Poultry	11.861	40	0.840

Source: Livestock Census, 1996. Pakistan Census Organization, GoP, Lahore

1. Livestock Census, 1996. Special Report on Pakistan. Pakistan Census Organization, GoP, Lahore
2. Livestock Census, 1996-98. Pakistan Census Organization, GoP, Lahore



Red Sindhi bull

pure bred stock. With the passage of time, because of a lack of knowledge about the merits of the breeds, the number of pure bred stock is declining due to indiscriminate breeding.

The shortage of purebred bulls³ can be attributed to:

- The high cost of managing and feeding of sires and breeding bulls which is becoming unbearable for small farmers.
- The non-availability of true to type breeding bulls.
- A weak artificial insemination programme.

Animal Health Status

Many infectious, contagious and parasitic diseases affect various classes of livestock in the province. The most commonly prevailing diseases among different species are given below.

- Diseases of large ruminants: Haemorrhagic septicaemia, Rinderpest like disease, Bovine viral diarrhoea, Foot and mouth disease, Scours (white diarrhoea), Fascioliasis and Trypanosomiasis (Surra).
- Diseases of small ruminants: Enterotoxaemia, Contagious pleuropneumonia, Anthrax and Fascioliasis.

Disease Prevention Status

There is a network of veterinary hospitals, dispensaries and veterinary centres at district, taluka and union council levels, respectively. These institutions provide treatment to diseased and sick animals. They also treat animals in the field through mobile veterinary dispensaries. In addition, at district level, a network of disease diagnostic laboratories is working for diagnosis of poultry and livestock diseases. There are 153 veterinary hospitals, 16 mobile veterinary units and 13 artificial insemination units. Besides treatment of sick animals, these institutions carry out work of disease control through preventive vaccinations

3. Ibid

against infectious and contagious diseases and drenching against parasitic diseases.

POULTRY PRODUCTION

Two types of poultry production exist in the province: commercial and subsistence. Commercial poultry production practised in the urban areas is based on the rearing of commercial poultry strains (layers and broilers) of exotic origin, whereas, subsistence or non-commercial poultry farming is based on indigenous poultry strains or breeds.

In Sindh, the poultry sub-sector has shown a declining trend from 1976 to 1998. In 1976, the number of layer birds in Sindh was 1.789 million, which increased to 4.129 million in 1985, and declined to 2.389 million birds in

1997-98. The share of layer birds declined from 62.99 percent (1976) to 26.97 percent (1997) in Sindh, whereas in Punjab, during the same period, its share increased from 34.01 to 64.94 percent. Nearly the same trend was observed in the number of broilers, the number of table eggs and poultry meat. Table 7.2 illustrates the seriousness of the situation.

CAUSES

The poor understanding of the importance of livestock and poultry breeding is reflected in the low proportions of the Annual Development Program (ADP) funds allocated to the sector⁴. Livestock contributes 11 percent to the national GDP and 28 to 31 percent to the total agricultural output.

Table 7.2: Percent Share of Sindh in Poultry Production in Pakistan

Year	Layers Maintained	Broilers Produced	Table Eggs Produced	Poultry Meat
1976	62.99	62.00	62.99	58.00
1977	61.49	61.00	61.49	57.00
1978	60.00	60.25	60.00	56.50
1979	58.00	58.60	58.00	54.75
1980	55.11	56.84	55.1	53.60
1981	56.62	52.66	56.62	54.00
1982	53.81	49.64	53.81	50.40
1983	55.40	50.86	55.40	51.75
1984	47.00	48.00	47.00	49.22
1985	45.00	43.18	45.00	40.69
1986	43.59	40.29	43.59	33.33
1987	36.83	41.27	36.83	36.93
1988	35.79	35.78	35.79	32.27
1989	31.17	40.05	31.17	37.00
1990	30.00	38.00	30.00	36.15
1991	28.50	36.62	28.50	35.50
1992	28.17	35.82	27.17	33.68
1993	27.74	33.10	27.74	31.90
1994	27.34	32.15	27.12	30.58
1996	26.28	30.30	28.07	29.15
1997	26.97	32.55	28.12	29.50

Source: Livestock Census, 1996 -1998. Pakistan Census Organization, GoP, Lahore

4. Rendall and Lockwood, 1982

An important cause for the low performance of the sector in Sindh is because the majority of livestock breeding is carried out in the rural areas of Sindh on a traditional system without the use of modern innovations. Even commercial dairy farming in urban areas lacks modern initiatives. On these farms, the herds are managed under traditional systems without due attention to hygiene, housing, and proper feeds and fodder. A high incidence of disease prevails because of a lack of knowledge about the benefits of timely vaccination and other measures of disease control.

Disease is a major deterrent to livestock breeding and poultry production in the province, in addition to poor nutrition and the unavailability of feed resources. Despite all efforts, disease diagnosis and monitoring systems are weak, as is the epidemiology of diseases. There is relatively little information on the incidence of diseases, animal mortality, geographical distribution, seasonality or dynamics and epidemiological interaction between hosts, disease agents and the environment.

The general consensus among researchers, planners, development specialists and progressive farmers is that feed resource limitations are the most pervasive constraints limiting animal number and productivity. Assessment of livestock feed resources carried at national, provincial, regional and farm levels indicate shortage of conventional feed resources. There are also many non-conventional feed resources that are not fully exploited at the farm level.

Vaccines are often inadequate to meet the need at the provincial level. In addition, the quality of vaccines is poor or they are not handled astutely in the field. The responsible organisations are unable to identify specific strains of infectious agents (e.g. foot and mouth disease) for vaccine production. Modern biotechnology for the production of recombinant vaccines has yet to be developed satisfactorily in the province. Veterinary delivery system is also inadequate, and it is estimated that less than 25 percent of the stock is being vaccinated while the remaining 75 percent remains under risk.



Badar Abro

Poultry is common in rural areas

EMERGING TRENDS

The production of livestock has increased mostly in numbers instead of an improvement in the production performances of the breeds. To improve the potential of the livestock sector, there are major issues that need to be addressed, which are a conducive environment for the animals including a strong infrastructure, and a marketing system, which allow for increased livestock production. In addition, public sector initiatives are declining because of a lack of monetary resources, a problem, not being adequately addressed by other institutional arrangements.

Despite the importance and potential value of the breeds in the province, many of them have been neglected. There is a need to fully study these indigenous genetic resources in order to make a valuable contribution to the environment to which they are adapted.

STAKEHOLDERS

The organisations and institutions concerned with livestock and poultry in Sindh are given below:



Photograph name ?

Commercial poultry production, practised in the urban areas, is based on the rearing of commercial poultry strains of exotic origin (Layers and broilers)

Public Sector Organisations

Animal Husbandry Department, Government of Sindh

The department has a network of veterinary hospitals, dispensaries and union council centres which have the primary responsibility to prevent and treat all kinds of domestic animals. Looked after by qualified veterinary doctors, the department provides treatment to sick animals and performs preventive vaccination against infectious and contagious diseases and drenching against parasitic diseases. Administratively, in each district, assistant directors supervise all veterinary para-veterinary staff. Each assistant director monitors the functioning of all veterinary hospitals, dispensaries, and veterinary centres in his district. The department organises horse and cattle shows on different occasions to raise awareness among farmers, where competitions are held for milk production and the owners of purebred animals are awarded prizes.

Poultry Research Institute, Karachi

This is the only research institute on poultry in the public sector which was established by the FAO. For some time, the institute was supervised and monitored by a qualified foreign advisor under a FAO/UNDP programme and lent its support to the emerging poultry industry in Sindh. Its mandate is to carry out research work on disease, nutrition, management, production economics and other aspects of the poultry industry.

Sindh Poultry Vaccine Production Unit, Karachi

This unit is working on the preparation of vaccines against poultry diseases like the New Castle disease.

Central Veterinary Diagnostic Laboratory, Tando Jam

This institute was established under a FAO/UNDP programme. This directorate has a

network of collection centres at various district headquarters from where samples, disease-affected body parts, tissues and faecal material are sent for investigation and diagnosis. This directorate is mandated to carry out serological surveys of commonly occurring diseases of livestock.

Vaccine Production Unit, Tando Jam

The Vaccine Production Unit in Tando Jam produces vaccines for large animals.

Other institutions:

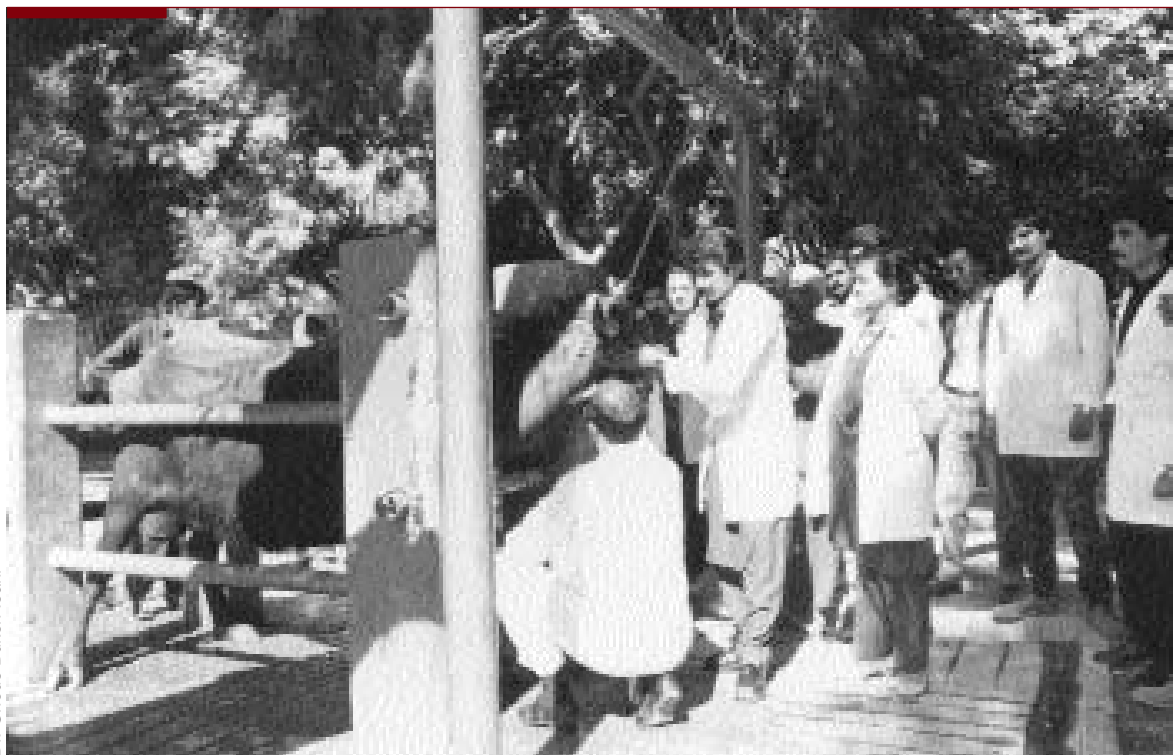
- Faculty of Animal Husbandry and Veterinary Sciences, Tando Jam
- Directorate of Animal Breeding, Hyderabad.
- Livestock Experiment Station, Korangi, Karachi
- Livestock Experiment Station Tando Muhammad Khan
- Livestock Experiment Station, Nabisar Road
- Livestock Experiment Station, Rohri
- Kamori Goat Farm, Dadu
- Arid Zone Research Station, Umerkot

FUTURE ACTION

There are several options to increase productivity per unit of livestock. Biotechnology has an immense potential to revolutionise animal production. The province of Sindh has excellent tropical breeds of livestock which are well recognised all over the world. Sindh's cattle, buffalo, goat, sheep, and camel breeds are multipurpose breeds and have a genetic potential. In order to conserve and improve productive capabilities of such animals, and for the development of livestock health, there are several options for future action.

Improved performance requires a better understanding of the fundamental relationships within the farming system. Far too often, livestock has been seen as a single-dimensional commodity and insufficient allowances have been made for the multi - purpose animals in a village setting.

With the exception of commercial poultry producers, research results generated at public institutes and agriculture universities should be transferred to the farmers through technology transfer and an effective extension system.



Dr. Ghous Buksh Isani

Treating a sick buffalo

Widely promoted technology packages in the past have neglected the enormous variability between farm resources and animal practices in Sindh. The technical packages imported from other countries lacked an understanding of the every day livestock techniques practiced by the local farmers and the basic rationale behind these practices.

Livestock is customarily maintained on conventional feeds coming from natural rangeland vegetation, fodder crops, cereals, and milling by products in the irrigated areas of the province. There is considerable evidence to indicate that the availability of these feed resources is declining rather than increasing against constant pressure of increasing livestock population, frequent droughts, and increasing pressure on cultivable land for the production of crops for human consumption. There are untapped resources for feeding of livestock which have not been fully utilised (Table 7.3).

For instance, Sindh has 21 sugar mills scattered in the rural parts of the province. The by products of the sugar industry such as bagasse, cane molasses, pith and others can be utilized for manufacturing feed for various categories of livestock to meet feed shortage.

The assessed nutrient shortage can also be improved by the silage of the banana plant and by treating dry manure with chemicals and dehydrating it (in order to reduce microbial contents and pathogens to make it more safe for animal feeding).

Crop residue like wheat, rice straw and cotton crop residue can be fed after their on-farm

physical or chemical treatment. Different types of chemicals are used for improving the digestibility and nutritive value of straw for livestock feeding. In Sindh, 2.172 million tonnes of wheat straw is fed annually to the livestock in untreated form. There exists a scope for increasing the nutritive value of this feed by treating them with urea molasses.

Despite its importance, livestock has been a neglected part of agriculture in Sindh. No visible improvement can be made in the absence of a sense of urgency and low investment in research and policies for sectoral development. Lack of technical labour availability appears to be another weak area. Although the research priorities have not been set, it is suggested that research should be focused on:

- Surveys to identify the characteristics of different livestock systems and to understand the characteristics of different sub-systems of livestock production such as dairy production, meat production, and draught animals.
- Determination of an economically attainable level of livestock production and identification of socio-economic constraints to attain higher levels of production.
- Analysis of factors affecting decision-making when investing in livestock in different socio-economic conditions, as well as within the context of a total farming system.

Artificial insemination, a modern tool for bringing rapid improvement in livestock, can be explored. In Sindh, out of households reporting ownership

Table 7.3: Availability of Feed from Non-conventional Resources

Feed Stuffs	Availability (Million Tonnes)	Dry Matter (Million Tonnes)	Crude Protein (Million Tonnes)	Total Digestible Nutrients (Million Tonnes)
Molasses	0.421	0.324	0.0013	0.293
Bagasse	2.337	1.169	0.0004	0.0005
Banana plant	2.969	0.008	0.005	0.0046
Total	5.727	1.501	0.0067	0.2441

Source: Livestock Census, 1996. Pakistan Census Organization, GoP, Lahore



Buffaloes are a major source of milk

of cattle and buffaloes, only 1.81 percent households reported use of artificial insemination for their livestock⁵. This indicates that about 98.47 percent farmers have no access to artificial insemination service for their herds.

Based on this research, an effective extension system needs to be established and sustained.

This cannot be done without considerable funds and without the involvement of academic institutions, which need to produce professionals and technicians who can plan and manage the research, development, and extension process.

5. Livestock Census, 1996-98. Pakistan Census Organization, GoP, Lahore



CHAPTER 8

Arid Zones



The arid zones of Sindh represent 17 percent of the arid land of Pakistan and can be classified as subtropical deserts. They cover an area of over 68,000 km of the province and can be roughly divided into three even-sized distinct regions of Thar, Nara and Kohistan. Out of a total area of 14.09 million hectares (MHA), 9.28 MHA form rangeland in these areas.

Table 1 in **Appendix 8.1: Flora in the Different Regions of the Sindh Arid Zones** gives details of the flora in the different regions of the arid zones of Sindh. Map 8.1 shows the locations of arid zones in Sindh

LOCATION

Tharparkar

The Thar region covers 23,000 km and has a population of nearly one million people¹. This region is mainly in the Tharparkar district and extends southwards along the Rann of Kutch. Thar or Tharparkar (including Nara) is the Sindh part of the Great Indian Desert and is located between 240 to 280 North latitude and 670 to 710 East longitude. The climate of Thar is arid in the north, and semi-arid in the south. Rainfall varies from north to south. Poor rains are encountered about every three to four years and a complete drought occurs once in every eight to ten years. The average range carrying

capacity increases immediately after the rains but reduces to 7 to 10 ha per five sheep during periods of low rainfall.²

Nara

The Nara region stretches over 22,000 km. Its upper portion lies in Sukkur (population 908,373,000), Khairpur (population 1,546,587,000), Nawabshah (population 1,071,533) and Sanghar (population 1,453,028) districts. Thar and Nara are located on the left side of the river and form the eastern boundary of the province.

Kohistan

The Kohistan region covers 23,000 km and occupies four percent of the total landmass of the province, consisting of parts of Dadu (90 percent of the area with a population of 1,688,811), Larkana (6 percent of the area with a population of 1,927,066) and Thatta (4



Muhammad Ali Qadri

Nearly one million people live in Thar in villages such as this one

1. Government of Pakistan, 1981. District report census of Tharparkar. Population Census Organization. Statistics Division, Islamabad
2. Ishaque, M.S, 1993. Sheep Production in Pakistan. Sheep Management Systems. Ed, Mackintosh. Pakistan Agriculture Research Council. Islamabad



Sand dunes surround a Thari village: the soil in arid regions is generally infertile because of severe wind erosion

percent of the area with a population of 1,113,194). Ecologically, it is categorized as a tropical sub-mountainous zone and is classified as a tropical maritime rangeland. Kohistan lies along the western boundary between Sindh and Balochistan and extends in the south along the Indus Delta.

These three regions comprise of vast sandy tracts broken up by undulating sand dunes and/or barren mountains. The soil is generally infertile because of severe wind erosion and vegetation consists mostly of stunted scrub and bush although trees such as the *kundi* (*Propos cineraria*) occasionally dot the landscape. The nutritive grasses provide fodder for the livestock that comprise of cattle, camels, goats, and sheep.

The amount of rainfall varies from year to year and the annual average for some areas is as low as 100mm. Most of the rain falls between July and September over a period of two to three days. Although rain occurs in the form of heavy showers, it creates no runoff. All the rainwater is absorbed by the dehydrated sandy

soil. After the rainfall, pastures regenerate and subsoil aquifers get replenished. However, after February, when the dry period starts, the lands get completely grazed and the subsoil water depletes and becomes saline. Sweetwater is scarce throughout the year and drought recurs every third year³.

The arid region of Sindh is perhaps one of the most underprivileged areas of Pakistan with extreme poverty, little or no physical infrastructure, a hostile terrain and difficult living conditions. The local population is deprived of basic services. Various line departments of the government have, at one time or another initiated a number of schemes for service delivery, but with poor results⁴.

The arid areas of Sindh have a diversity of ecosystems, habitats, and species. Due to overgrazing, degradation of soil cover and frequent droughts, the ecosystem and habitats of wildlife of the arid zones are badly affected. The palatable species of grass are vanishing and being replaced by plant species not preferred by the grazing livestock. The Ibx of

3. Government of Pakistan, 1973. Rangelands of Pakistan, National Range Management Committee. Government of Pakistan. Islamabad

4. Ibid



Khuda Bux Abro

Water collection from a well in Thar

Kohistan and the Black deer and peacocks of Tharparkar are animal species unique to this region. These species are in danger of extinction because of illegal hunting practices by Pakistanis and foreigners. Details of the important animals of Sindh arid zones are given in **Appendix 8.2: Important Mammal Species of Wild Animals of the Arid Zones of Sindh.**

CLIMATE

The climate of the two regions, Thar and Kohistan is arid subtropical-monsoonal. The mean minimum and maximum temperatures vary from 5°C to 45°C. High temperatures are experienced in summer in which plant species with low vigour and shallow root systems cannot survive. Maximum temperature is high in these regions, especially in the dry season when there is little cloud or moisture in the atmosphere to absorb the sun's radiation. Not only is lack of moisture in the form of rain the chief factor causing arid conditions, but low air humidity in itself has an adverse effect upon plants and animals.

In Kohistan, extreme temperatures are as high as 45°C in summer and as low as 3°C in winter. Mean annual rainfall varies from 150 to 200 mm, most of which is received during summer. Strong winds blow from the south-west to north-west at 60 km per hour. Due to severe wind erosion, the top-soil is thin and most of the rocks contain limestone. Areas in the valleys contain silt to loamy silt with a thick layer of sand. The velocity of the winds increases as summer advances in both the regions. These conditions make even rain-fed agriculture difficult.

In Thar, during the months of May and June, violent winds blow with a velocity of more than 40 km per hour and cause severe wind erosion, especially in cultivated areas and in areas that are subject to heavy grazing. At the end of April or in May, and sometimes in June, the wind velocity reaches 60 miles per hour. The atmosphere is charged with dust and fine sand which moves the most where the sand dunes are under heavy grazing pressure or where cultivation had destroyed the vegetation.

LIVESTOCK AND RANGELAND CONDITIONS

The region has a total population of 4.87 million heads of livestock valued at Rs. 7.5 billion and 7.5 million heads of poultry valued at Rs. 375 million. Livestock production is the main economic activity of the people of the arid regions, about 76 percent of whom are engaged in raising livestock⁵. The livestock wealth is considered a mark of dignity and production systems are the result of an interaction between climate, soils, altitude, availability of water and indigenous flora and fauna.

Livestock raising is carried out on a permanent basis in settlements like villages and towns where water and other amenities of life are available throughout the year. Areas plagued by water shortages, however, witness a migratory pattern as people migrate with their livestock to the flood plains of the Indus or to the barrage areas in the dry season or in periods of drought.

Rangelands provide most of the forage (up to two-thirds) for livestock feed in the arid regions. The rangelands are mostly state property. Most of the people graze their own livestock, but herders are also employed especially during and after the rainy season when crops are sown and farmers do not allow the animals to enter the fields.

Milk is a major source of protein in the arid areas, including camel milk, which contains larger quantities of vitamin C and minerals than the milk of cattle or buffalo. After the rains, milk production increases because of higher availability of fodder. Surplus milk which is beyond the needs of the family is sold to the hotels in the major towns or converted into butter and *ghee*.

Wool and hair is produced as a by-product of the livestock industry and is as important as milk and meat production in the arid regions. The wool is coarse; therefore it is used in the carpet industry while the goat and camel hair are used locally for preparation of different

household articles and for making shawls, blankets and rough cloth. The hair of animals is mostly used for preparing ropes.

The breeding of livestock is an unscheduled activity in the arid zones. The traditional natural system of breeding is still being practiced and the farmers are unaware of artificial insemination or other modern techniques that could be used by them.

Most common diseases among animals in the arid regions are anthrax, black quarters, foot and mouth disease, enterotoxemia, contagious caprine and ovine pleuro pneumonia. The few veterinary dispensaries and hospitals cannot meet the demand as medicines and vaccines are invariably in short supply. Resulting in a perturbing statistic; less than 25 percent animals are vaccinated.

During drought periods when the range vegetation is exhausted, livestock are stall fed, which is a costly proposition. The absence of a road infrastructure makes importing fodder from the barrage areas far too expensive. Due to under and malnutrition, animals lose their body weight very rapidly and become emaciated. Ultimately, a high rate of mortality occurs in the herds and the farmers suffer economic losses.

There are no livestock improvement and development projects in either public or private sector in the arid areas. There is a general lack of awareness about the merits and demerits of the breeds, and although there is an understanding of the economic benefits of improving the rangelands, there is no understanding of how to do it.

The arid regions do not have a well-developed marketing system and are mostly serviced from the irrigated farming areas of Sindh. The areas where livestock raising is concentrated have no access to a road network. Most people travel on foot or on camel. Still, with the influx of large numbers of six-wheeled drive trucks (called *khera*) and jeeps, Thari people have become a little more mobile.

5 . Agrodev. 1998. Physical Characteristics and Resource Endowment. Agrodev Canada Inc



Nasir Ali Panhwar

A dried up well: water scarcity due to desertification

DESERTIFICATION OF PASTURE LANDS

Pasture lands in the arid region are being desertified for a number of reasons. The most important of these is a change from a barter subsistence economy to a cash economy. As a result, communities are increasing their livestock since this is the simplest means of generating cash. Due to this, over-grazing is taking place. The approximate stocking ratio for excellent rangeland conditions is quoted as 30 cattle equivalent units per hectare. In Thar, the stocking ratio is 68 head per 100 hectare in degraded rangeland. In their present condition, the rangelands as such are incapable of supporting the current livestock population. Again, due to overgrazing, soil stabilisation suffers and the desert winds carry off the top soil making re-generation of the rangelands difficult.

Rangeland management has also suffered due to decline in the effectiveness of feudal and government institutions which were responsible for its management. Changes in the eating habits of the desert communities, coupled with

an increase in population has taxed the meagre timber resources of the rangelands resulting in increased use of timber as fuel and for house construction.

WATER CONSERVATION

Traditionally, the feudal system was responsible for the development and maintenance of water sources. Rainwater was channelled to depressions in the desert which is known as *tari*. These were desilted annually through *begar* or forced labour which was organised by the feudal authority. Wells were regularly developed and maintained by the *koaria*, or well diggers, who were professionals in the field. However, with the decline in the effectiveness of feudal authority, collective action on a non-commercial basis for the maintenance and operation of water sources has declined and in most cases is no longer in practice.

EMERGING TRENDS

The most important change in the arid regions of Sindh is that the feudal authority, which

Box 8.1: Thardeep Rural Development Programme (TRDP)

In 1987, after a long drought and near famine conditions, UNICEF, Save the Children's Fund (SCF-UK), and the government of Pakistan initiated a short term relief programme. This programme followed a drought assessment which also proposed a long term development programme for Thar. As a result, TRDP was created. From a relief programme, TRDP moved on to become a research and extension organisation to facilitate the ongoing transformation of Thari society. Interventions such as implementing a savings programme and developing necessary skills and tools were undertaken. The programme now operates in 86 villages of Tharparkar through six TRDP field units.

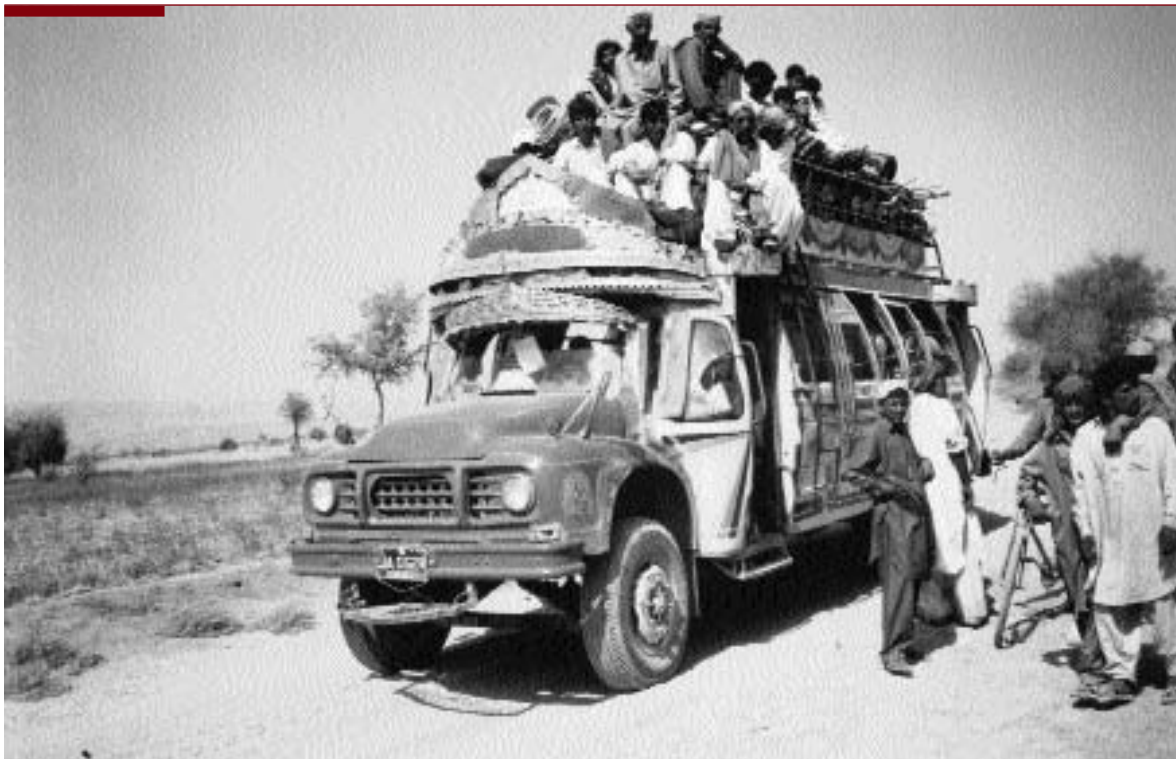
The programme includes a revolving seed bank, micro-enterprise development, rangeland management, environmental rehabilitation, education and health, water source development, and its operation and maintenance. The local communities and organisations are closely associated with all these programmes. Conditions in the areas where TRDP is working have improved considerably.

Source: Thardeep Rural Development Programme

organised collective work for the development and maintenance of water sources and related infrastructure, has become ineffective. Many of its members have abandoned herding and agriculture and taken to trade, commerce and white-collar professions. This is coupled with the emergence of a cash economy which has brought about a major change in the caste-ridden arid zone communities. New forms of associations and community organisations are required to replace the functions that the feudal authority once fulfilled. Attempts at this are

being made by some NGOs, prominent among them being Thardeep, which operates from Mithi, in Tharparkar (see Box 8.1: Thardeep Rural Development Programme).

The trend of uprooting shrubs, cutting trees for fuel wood, and overgrazing due to overstocking and population pressures, are increasing. If this continues, the already exhausted rangelands will not be in a position to support the existing level of livestock population of the arid regions. As a result of continuous and uninterrupted



Tasneem Bhatti

Transport in Kohistan, District Dadu

degradation of natural resources, the population will have little choice but to migrate to the urban centres for their livelihood. This trend is already gaining ground rapidly⁶.

Trees such as *khejri* (*Prosopis cineraria*), *rohiro* (*Tecoma undulata*), *beri* (*Zisypus mauritna*) that normally grow in good soil conditions have almost disappeared. Trees and shrubs that have replaced them are the Ak (*Calotropis procera*) and *Aristida fumiculata*. Both are multiplying rapidly and are indicative of degraded rangelands. *Phog* (*Alligonum polygonoides*) is an important soil stabiliser and in the areas where it has become scarce, soil erosion is taking place. Because of selective grazing, it seems that only shrubs and trees that are unpalatable to the animal population are likely to survive. Unfortunately, these plants are not good soil stabilizers⁷.

As a result of desertification, the land will not be able to meet the demands of the animal population even in years of good rainfall. If animal husbandry has to continue to be a source of livelihood, then either fodder would

have to be imported to the desert or a massive programme for rangeland management and rehabilitation would have to be undertaken. Importation of fodder is an expensive option in the absence of road infrastructure, of which there is very little in the arid regions.

A network of veterinary hospitals, dispensaries and veterinary health centres has been established in all the arid zones of Sindh. These institutions are looking after the health of all species of domestic animals. A central diagnostic laboratory is working for disease diagnosis and serological surveys in the province including the arid zones. These are important developments, but NGOs are required to act as a liaison between government inputs and the arid zone communities to make them accessible and effective and also to establish an equitable relationship between the public sector and the communities.



Nasir Ali Panhwar

Carcass of a dead animal: animals suffer due to the frequent droughts

6. Hasan, Arif. 2001. *The Unplanned Revolution: Observations on the Process of Socio-economic Change in Pakistan*. City Press Karachi
7. Ibid



Rainwater harvesting at Karoonjhar hills

STAKEHOLDERS

Livestock Raisers

Livestock owners are aware of the problems of desertification and its causes but they have no long term vision of how these problems can be overcome. As a result of poverty, they keep increasing their cattle since alternative sources of livelihood are not available to them. Collective action is required to overcome these problems, which can only be effective if community organisations replace the now ineffective feudal institutions. Models for such organisations are being created in some arid regions through the work of NGOs such as Thardeep.

Forest Department

The Forest Department has the mandate to manage and improve rangelands, watersheds, forests and tree plantation. The department has not achieved any success in the arid zones of the province as far as the conservation, improvement and sustainable use of

rangelands is concerned except in the rehabilitation of the Dhabeji range.

Department of Agriculture

The Department of Agriculture has a huge infrastructure in the province based on extension departments and research institutes. Yet, they have not made any breakthrough in dry-land agriculture or in the yield of irrigated crops. The research wing has not been able to introduce high yielding varieties of fodder crops for the arid zones and has pursued sectoral development without integration with livestock production.

Sindh Arid Zones Development Authority (SAZDA)

SAZDA has multi-dimensional responsibilities for the development of different sectors of the arid zones including the conservation of resources but it has so far failed to fulfil its obligations and mandate.

Department of Animal Husbandry

The primary responsibility of the Department of Animal Husbandry is to provide treatment to sick animals and carry out prophylaxis and breed improvement work. The department has considerable infrastructure, veterinary care and animal production but the work of the department is hindered because of an absence of road infrastructure that makes logistics both difficult and expensive.

Arid Zone Research Centre, Umerkot

The institute is a sub-centre of the Arid Zone Research Institute of Quetta and is sponsored by the Pakistan Agriculture Research Council (PARC), Islamabad. The research centre is working on the rehabilitation of rangelands but their work is very limited in scale.

FUTURE ACTION

Infrastructure

The creation of an effective road infrastructure is critical for the arid areas of Sindh. It would enable the communities to sell their livestock at a better price to urban markets; transport fodder for animals in period of drought; reduce the cost of every day items (such as tea, food, clothing) which are now in demand after the introduction of the cash economy; and establish a more equitable relationship between the communities, the transporters and middlemen. Both extensive social and economic benefits are reaped in parts of Thar where road building has taken place.

It has been noted that there may be under-utilisation of rainfall resources during the years of heavy rains and much of the water available during the rainy season is not stored. Therefore an essential resource is wasted. There is a pressing need for water resource management through the construction of small dams and reservoirs in Thar and small water collection and/or slow action dams in Mahal Kohistan

where a good number of *nain* flow during the rainy season.

Livestock

Government policies regarding the management and improvement of rangelands in the arid zones need to be implemented. Work on the crossbreeding of *Kacchi* sheep with the *Awassi* breed has not proved to be very successful. Similarly, experimental work carried on *Thari* and Red Sindhi cattle breeds at livestock experiment stations in Nabisar Road, Tando Muhammad Khan and in Karachi has not had any impact on the private sector. This may be because packages for transfer of technologies have not been developed. In addition, no appropriate policies have been framed at both national and provincial levels regarding the development of livestock and feed resources during periods of scarcity. These need to be drafted and implemented. It has to be understood that the improvement and development in livestock production is dependent on the state of the rangelands. Improvements in the conditions of the areas and effective programmes involving the local communities are required.

The quantity of wool sheared in Thar is comparatively inferior and turns pale and yellow due to long exposure to the sun and heat, which lowers the value of the wool. Pale or yellow wool has very low affinity towards dyes. This is a crucial problem, requiring further study and research. Before shearing, the animals are not washed, which means their wool contains a lot of dirt, sand and vegetable materials that lowers its market value. Extension programmes to promote better curing practices need to be developed.

The problem of livestock feeding during lean periods or periods of feed scarcity can be resolved through the use of modern technology and by using unconventional feed resources. For example, briquettes can be prepared by using wheat straw, cane molasses and urea. Such supplements are not only easy to store for long periods but can be carried over longer distances without difficulty.

Windmills may be installed in the range area to lift water from open surface wells. Water

spreading can be tried as it helps in controlling soil erosion and movement of sediment, and also results in the conservation of water for increasing forage production.

Reseeding of grass is an option, particularly in those ranges where the desirable species of grass are lost either due to overgrazing or soil erosion. A lot of emphasis is being placed on improvement of such ranges through artificial reseeded in Pakistan.

One of the main causes of depletion of the ranges in Sindh is the practice of cutting and

uprooting trees and shrubs for use as fuel. Efforts have to be made to select and promote the planting of multipurpose trees and shrubs that can be used for providing fodder for animals and fuelwood for domestic cooking.

There is a need for research and development projects if improvement is to be made of the range areas for which resources are needed. These projects would facilitate marketing, supplementary feeding, credit, and health cover and disease prevention for animals.



CHAPTER 9



Forests



A

n area of 1.126 million ha or eight percent of the area of Sindh comes under the control of the Sindh Forest Department. Of this, riverine forests and irrigated plantations cover a mere 2.29 percent area, clearly indicating that the province is deficient in forest resources. The remaining area under the control of the Sindh Forest Department consists of mangrove forests and rangelands.

Table 9.1 outlines the forest types in Sindh Map 9.1 shows the types of forest in Sindh.

FOREST TYPES

Prior to World War-II, the forests of Sindh were well stocked. This resource was exploited over time but due to excessive felling of mature trees to meet fuel requirements for defence installations and for the railway system, loss of forest cover intensified during the war.

The advent of the Indus flotilla in 1825 and the railways in 1858 brought about commercial exploitation of forests in Sindh. From 1857 to 1895, the felling of trees was carried out ruthlessly. There was no progressive proactive approach to redress this damage. From 1895 to 1935, except for a short period of three years during World War I, the demand for forest timber remained relatively low, which enabled some reforestation to take place.

A progressive management programme for tree felling was initiated in 1935 and followed for nearly twenty years; however it was upset by the advent of World War II in 1939. There was an intense demand for firewood and coal from the Sindh forests while Karachi, too, had grown and needed firewood for fuel. For the first time in history, the use of coal was rationed in Karachi.

Meanwhile, over-felling increased to such an extent that areas due for felling in 1957 were cut down in 1944, thirteen years ahead of time, till there was no mature crop left. Highly dense forests fell prey to mismanagement on the one hand and the war demands on the other¹.

The fauna and flora of the Sindh have been adversely affected as a result of over-exploitation. In its 1987 position paper, the Sindh Forest Department stated that: "An inventory carried out lately shows that almost 50 percent of the riverine forests are so degraded that their productivity is no longer of economic value. The position is bound to deteriorate further if effective measures are not adopted to provide improvement of the water regime to augment the source in order to make the forestland productive. If it is not done, apart from the dwindling position of wood production, the usual protective effects of the forests will be lost, as a consequence to which the entire ecological setup is likely to degenerate". A list of trees, shrubs and other plants of the forests of Sindh is given in **Appendix 9.1: List of Trees, Shrubs and Other Plants of the Forests of Sindh**.

The Sindh forests harbour a large number of medicinal plants such as *mithozehr* (*aconitum-napellus*), *bankhewro* (*agave americana*), *gulkhero* (*althaea-rosa*), *kanwargandal* (*aloevera*), *phog* (*calligonum polygonides*), *sagghal* (*chenopodium-album*) and *golarho* (*coccinia cardifolia*).

Gum, which also has medicinal properties, is extracted from the *babul* tree while Lac is another forest produce obtained through *lac-insects* that are now almost nonexistent. Thatching materials used for the construction of roofs for houses are also obtained from the forest undergrowth.

Riverine Forests

Riverine forests owe their existence to the flooding of the River Indus and are the mainstay

Table 9.1: Forest Types in Sindh

Category	Type	Area (Million Acres)	Percentage of Total Land Area of Sindh
Productive forests	Riverine forests Irrigated plantation	0.5960.203	1.710.58
Protective forests	Mangroves Rangelands	0.8521.131	2.453.25
	Grand total	2.782	7.99 Say: 8.00

Source: Forest Department, Government of Sindh

1. Feasibility report of the Riverine Forests of Sindh



Riverine forests found within the protective embankments on either side of River Indus

of forestry in Sindh. They are located along the Indus within protective earth embankments constructed to confine flood water.

Presently, riverine forests cover an area of 85,000 ha (35 percent) densely populated and 27,000 ha (11 percent) sparsely covered with trees. Moreover, 39,000 ha (16 percent) is covered with shrubs and small-sized trees, which are the main source of fuelwood². The rest of the 38 percent consist of bare land covered with scattered shrubs. The main tree species grown are *babul (acacia-nilotia)* 60 percent; *kandi (prosopis-cinraria)* 14 percent; mesquite (*Prosopis-juliflora*) 12 percent; *lai (tamrx-dioca)* 9 percent and others 5 percent. These forests are diminishing at a rapid pace.

Mangrove Forests

Once considered to be mosquito-ridden swamps and wastelands, mangroves are areas of great economic potential and ecological importance. These forests are located in the deltaic region of

the river Indus in Karachi and Thatta districts with an average annual yield of 0.2m³/ha. A salt tolerant species *Avicennia marina* (timber) constitutes 99 percent of the total vegetation growing in these areas. Distribution of mangrove species in Pakistan is given in Table 1 of **Appendix 9.2: Mangrove Species in Pakistan and their Depletion**. These forests, besides having environmental value, also protect the Karachi and Bin Qasim ports from siltation and erosion. They are a breeding ground for shrimps and other edible cetaceans that provide for economic activity in the export market. Mangrove restocked forests also provide low-grade timber for house construction, poles for boats, fuelwood for curing and fodder for livestock. Having been neglected in the past, they are now being protected and their scientific management is emphasised. (See Chapters 10, 11 and 12 for more on mangrove forests).

Based on satellite imagery, the mangrove forests in Sindh are the sixth largest in the world but have recessed from 263,000 ha in 1977 to about 160,000 ha in 1991³(for details see

2. Forest Department, Government of Sindh
3. Farah and Meynel, 1992

Tahir Qureshi



Construction of breakwater is disturbing the ecological balance of the mangroves

Table 2, Appendix 9.2). One of the major reasons for this decrease is the absence of Indus water in the delta due to the non-implementation of the 1991 Indus Water Accord between the provinces. Due to a lack of water in the delta, there has been sea intrusion in half of the Keti Bunder taluka (district)⁴. Two tappa and four deh in Sakro taluka, and three tappa in the Kharo Chan taluka have lost their fertility for the same reason. Sea intrusion in 2002 also devastated eight taluka of the Badin and Thatta districts⁵.

Irrigated Plantations

Development of irrigated forestry began in the 1960s and increased throughout the 1980s and the 1990s with the allocation of funds under the Annual Development Programme and the involvement of foreign donor agencies. Over 45,000 ha of irrigated plantation zones in Guddu and Sukkur barrages were established. In addition, irrigated plantations were initiated under the Forestry Planning and Development Project with the United States Agency for International Development (USAID) in the early

nineties, and an area of over 2,080 ha was planted.

Under the auspices of another foreign donor, the Asian Development Bank (ADB), 18,965 ha of new irrigated plantations have been established or rehabilitated throughout the province. However, the scope and success of raising industrial species in these plantations has been greatly limited. This is due to a number of factors including reduced supplies of water, increases in waterlogging and salinity, and inadequate funding from the government.

Around 33,000 ha (40 percent) of the irrigated plantations are densely covered with trees and 17,500 ha (21 percent) are sparsely covered. The remaining 31,500 ha (39 percent) are either bare or are used for other purposes. Tree species found here include *babul* (58 percent), *shisham* (*dalbergina sissco*) (20 percent), eucalyptus (10 percent), mesquite and others (12 percent). Other varieties grown in the irrigated plantations of Sindh are *salmalia mala baricum*, *morusalba*, *syzygium cumunii*, *conocarpus lancifolius* and *leucaena leucocephala*.

4. Prof. Muhammad Ali Shaikh, Agriculture in Sindh

5. As expressed by the secretary Power and Irrigation, Government of Sindh on October 26, 2002 in a meeting in Karachi

Rangelands

The rangelands declared as protected forests in 1958 have been discussed at length in Chapter 8 Part 2 on Arid Zones.

Social Forestry

In 1973, the Sindh Forest Department launched a modest social forestry programme under which container plants, bedded nurseries, wind breaks and shelter belts were raised. Babul seeds were also provided to farmers and the general public at subsidized rates. Encouraged by the positive response to this programme, the department launched a more extensive social forestry programme from 1988 to 1996. In addition, there has also been a USAID supported initiative in 1985-86 and 1994-95, known as the Forestry Planning and Development Project. Another initiative under the same name has also been sponsored by the ADB in 1991-92 and 1999-2000. Almost 90 percent of all timber and firewood used in the province are extracted from privately owned lands. This illustrates the potential of the social forestry sector for the future.

FOREST RESEARCH IN SINDH

Forest research began in the early fifties by establishing a Silviculture Research Division in Hyderabad. This led to the establishment of various other research centres for planting and propagating certain fast growing forest species of industrial importance. A hybrid of the poplar tree was introduced for industrial use. Various clones of *P. deltoids*, and *P. Euamericana* were planted to establish archives in Miani, Khathar and Mirpur Mathelo research stations.

After the successful introduction of various species of eucalyptus, some exotic varieties were also introduced, including *Lancefoleus* in the early sixties, which proved successful in saline and waterlogged conditions. Australian *Acacias* too showed good results. They can be used for fuel, fodder and timber. Research was also conducted to study the effect of saline

effluent of the Left Bank Outfall Drain (LBOD) on various species and on the mangrove ecosystems as well as their rehabilitation.

NEW INITIATIVES

Ecotourism

Areas in different ecological zones have unique vegetation, wildlife, physical and climatic features. These can be used to attract ecotourists and lovers of nature.

Ecotourism can generate income for local people who are normally poor and are plagued by low employment levels. For example, the Dokri plantation range of Larkana division has the oldest archaeological heritage of Moen-jodaro, situated in the Bagi Forest. This can be developed for ecotourism.

Sericulture

Activities related to the production of silk have traditionally been regarded as women's work, and the introduction of sericulture can help improve economic and hence social conditions for them. A Sericulture Wing was established in Sindh during 1977, and the development programme for rural women in the province was initiated in 1980 by the Women's Division, Government of Pakistan.

Training has been provided in the districts of Hyderabad, Sukkur, Ghotki, Tharparkar (Naukot), Nawabshah and Sanghar. The knowledge necessary for the rearing of silkworms and the production of cocoons was effectively imparted upon 500 rural families. However, this initiative is still in its infancy and has not yet achieved the status of an industry in the province, due to a lack of financial and technical resources.

Apiculture

A modest programme was initiated in the province through the "Introduction of Apiculture in Sindh" scheme in 1982 for a period of three years by importing six honey bee colonies from

Australia. The rearing of honeybees is beneficial for agriculture and other tree crops such as mustard, sunflower, *burseem*, *ber*, arita, mesquite, coconut and ariciennia. Training programmes for women and rural communities along with bee culturing were initiated at the time.

Lack of regular funds as well as the absence of a qualified consultant to monitor and guide the development work affected this programme adversely.

CAUSES FOR PRESENT CONDITIONS

It is evident from the above that the sustainability of forests in Sindh is threatened. The causes are mismanagement, social policy and climate change.

The present management system does not allow for independent and professionally sound work in the interest of forests and communities. It is centralised and the revenue generated is not reinvested in the harvested forest area. These issues tend to de-motivate professionals and workers of the forestry department.

Some of the hard facts pertaining to forest management indicate a high level of landlessness among households, a deplorable law and order situation, lack of basic facilities like health, education, employment and transport to local people. These dismal social indicators contribute to illicit and indiscriminate felling of trees.

Another major aspect of forest degeneration is the presence of a large number of landowners around the riverine areas. These landowners wield political power through which they are able to acquire forestland either on lease or illegal occupation. It has been observed that areas with tree cover have been completely denuded after such leases have been given. As a result, in 1984, the Sindh government banned all forest leases.

The climate change in recent years has brought long periods of drought. Reduced inundation

coupled with increasing transpiration (due to rising temperatures and global warming) from the trees and plants have impacted forest well-being in Sindh.

The pressure of population and cattle around the forest blocks is increasing every day and the forest service staff is now under tremendous pressure to save whatever is left. With almost no support from local public leaders in preserving forest wealth and educating people regarding the value of forests, their task is all the more difficult.

The Sindh Forest Department was treated as a revenue-generating establishment; thus the finance department set ambitious annual revenue targets. As a result, large areas were harvested each year without considering the management plan prescriptions and whether these areas would be restocked owing to the reduced annual inundation from the Indus.

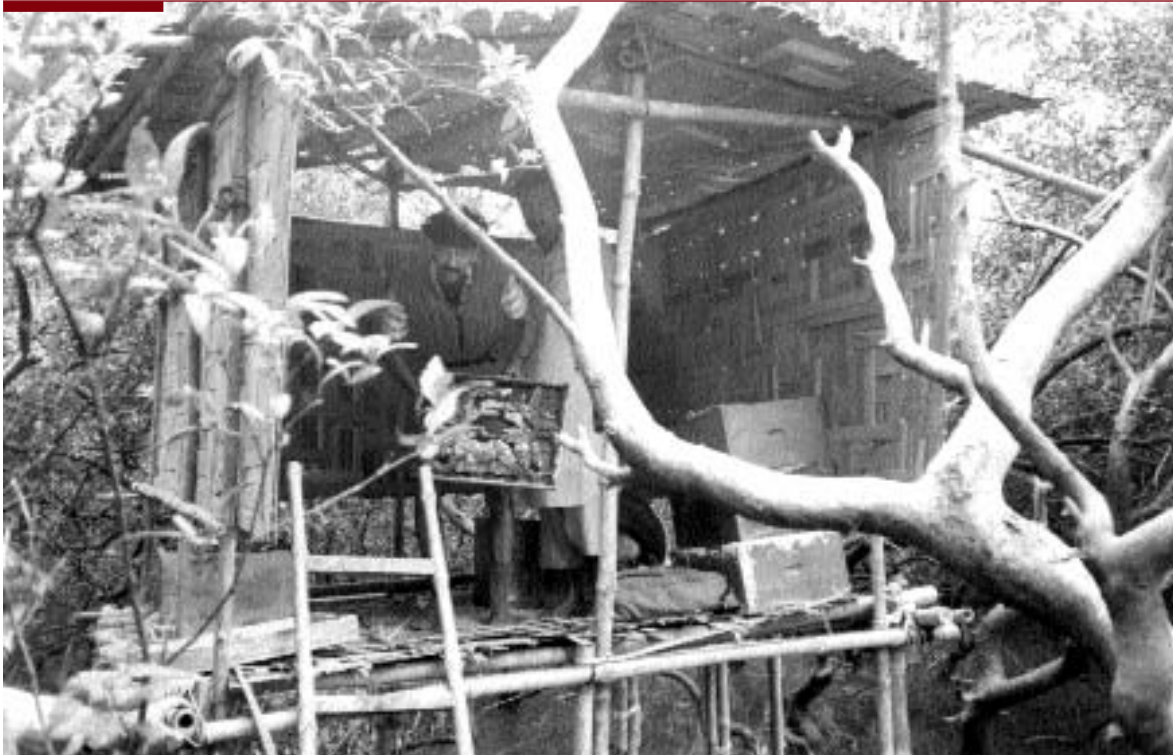
In addition, the department remains a low priority area. Hence, meagre funds are allocated for the sector as a whole especially for undertaking silvicultural operations such as weeding, cleaning, desiltation of irrigation channels and thinning. The provisions made rarely equate to what is required. In fact, with time the gap between demand and supply for funds widens. The Sindh Government for the forestry sector increased funds allocated from Rs. 118.252 million against a demand of Rs. 120.525 million in 1996-97 to Rs.177.936 million against a demand of Rs. 212.946 million in 2001-02⁶.

The district nazims of Sukkur, Ghotki, Shikarpur and Jacobabad are urging the government to clear the forest areas and demanding the dissolution of a ban on cultivation because they claim that these forests provide a refuge for dacoits. It has been reported in the local press that it is feared that other nazims will follow suit⁷. This poses a serious threat to the forests.

There are several reasons for the deterioration of mangrove forests. Although they have traditionally provided fisherman and grazers with fodder, timber, and fuelwood, their over-exploitation by selective cutting of useful species has added to the ecological pressures.

6. Office of the Budget and Accounts Officer Forests, Sindh

7. Daily *Kawish*, 22 April 2002



Honeybee keeping in the mangroves

A 1989 survey indicated that 50,000 grazers were permanently settled in villages along the mangrove tract. A further 10,000 arrive to graze thousands of camels in the forests for the four summer months when the Indus is flooding. The number of grazing animals in the Indus Delta is given in Tables 1 and 2 in **Appendix 9.3: Grazing Animals in the Indus Delta**.

Oil discharged by ships visiting the Karachi harbour pose an additional threat to mangroves. When deposited on pneumatophores, the oil cuts off oxygen supply to the roots. Around 3,000 to 4,000 ships visit the port each year. In the course of routine operation, ships discharge oily ballast, bilge water and cargo tank washings. Spills from oil tankers and general cargo vessels, domestic waste, and washouts from the port area and industrial effluent flowing in from Lyari and Malir rivers are significant sources of pollution. Details regarding these issues are given in Chapter 11 (Coastal and Marine Ecosystems).

EMERGING TRENDS

The Devolution Plan 2000 advocates the assignment of the forest extension to the district

as part of the Agriculture Department. The tasks allocated to the district governments include: maximisation of afforestation; the creation and maintenance of new resources including amenity forests and recreational parks; and framing and enforcing management plans.

In 2002, the Sindh government constituted a steering committee, which supervises the management of Kacho areas falling within the precincts of the districts of Sukkur, Shikarpur, Ghotki and Jacobabad. This committee working under the guidance of the Minister of Agriculture, Forest, Wildlife and Environment was commissioned to dispose off all the marginal and arable state-owned land within the district boundaries of Sukkur, Shikarpur, Ghotki and Jacobabad following the present land grant policy. It is assigned the task of formulating a short and long term biodiversity, conservation, ecosystem improvement and poverty alleviation plan in the Kacho area through various viable mitigating measures to increase productivity and reduce unemployment. It will also explore development projects and involve local communities in their implementation and subsequent management. The committee is empowered to establish a local banking system along the lines of the

Khushhali Bank, enabling it to provide short and long-term loans to local residents without collateral to allow them to establish an infrastructure for agro-silvo-pastoral-oriented projects.

Riverine Forests

Depletion of forest resources reached such an alarming proportion that harvesting had to be banned in 1993 for two years. This action of the government facilitated conservation of the growing stock. Fortunately, all successive governments have maintained this restriction.

As a result of a declining trend in the annual inundation from the Indus, a nominal area is revived every year in the riverine forests. In 1988-89, 4,634 ha was regenerated; in 1997-98, 1,692 ha; and in 2000-01, it dwindled to a mere 877 ha.

Mangrove Forests

The forest department has successfully reintroduced the highly salt tolerant *Rhizophora mucronata* which are already bearing fruit and regenerating naturally through their roots. The

department is now concentrating on this relatively fast growing species for future afforestation of the mangrove areas of Sindh.

IUCN's Coastal Programme has been coordinating with various agencies including the Forest Department in a joint effort to deal with pollution and mangrove rehabilitation. Long term interventions require a restriction on the use of timber from the mangrove forests by raising fuel wood plantations and increasing fodder production in neighbouring communities.

Involvement in the rehabilitation and protection of un-stocked areas of mangrove forests has also been proposed. Priority is given to conserving 240 km of the coastline from erosion; preventing cultivated fields located beside the coastal belt from winds and storms; reducing siltation of Bin Qasim Port; sustaining limited quantities of fuel wood and fodder for local needs; and preserving the unique ecosystem for posterity.

Irrigated Plantations

Over the years, various schemes have been developed for the expansion of irrigated



ECK, IUCN

IUCN, mangrove restoration project

plantations. A list of some of these is given in **Appendix 9.4: List of Schemes for Irrigated Plantations.**

Moreover, the Forestry Sector Master Plan (FSMP) proposes certain interventions for the period 1995-2020, during which the target to be achieved is the afforestation of 25,000 ha at the rate of 1,000 ha annually.

STAKEHOLDERS

The stakeholders in the forestry sector in Sindh include the forest department, farmers and communities, particularly women who are the wood users, as well as NGOs, politicians, and administrators. Through their collaboration, awareness needs to be created about the degradation that has already set in and the necessity to retard retrogression. They need to be made aware of the benefits of a participatory approach for resource development, its sustainability and environmental stability.

Provincial Sindh Forest Department/Local Communities/NGOs

Sindh's forests have declined in terms of productivity. The department has to find ways of working with the local communities that are residing in and around these forests with their livestock who need fuel, fodder and wood for their hutments and for agricultural implements. The foresters have to depend upon them for the maintenance and protection of the resources they use.

Forest Contractors

Contractors are the foremost predators of the forest as they are able to form pools to manipulate bids, violate forest regulations and seek support for their illegal activities from local influentials and law enforcers.

Coal Mining Industry in Balochistan

The industry depends significantly on Sindh's forests for the supply of all types of *babul* pit

props, ballies, and wooden planks of *kandi* for the exploration of coal.

Wood Users

Villagers must be encouraged to establish forest based cottage industries in their locales.

The government should provide incentives and create linkages between producers and markets. The producers need to be trained in proper spacing, thinning, and pruning of trees and seasoning, preservation, and preparation of wood according to the requirements of the market.

Mangrove Forest Stakeholders

Local communities (fisherfolk, grazers and cattle-owners) need to be educated, motivated and made aware of the importance of this resource. Technical advice must be imparted for their own interests; to look after the natural wealth of the coastal areas and to achieve the conservation of growing stock and balance in providing forage facilities. Attempts should be made by the territorial staff to enforce rotational grazing and browsing in these forests.

Apart from the stakeholders mentioned, the Sindh Forest Department, agencies working on the conservation of mangroves, environmental agencies, researchers, social scientists and anthropologists are also important and must not be neglected.

Irrigated Plantation Stakeholders

The stakeholders are the same as for the riverine forest and have the same roles. However, there are some new actors for the irrigated plantations who are identified below:

Public institutions

An institutional set-up for the implementation and monitoring of policies and strategies is necessary. There are four state institutions responsible for the establishment,

maintenance, and protection of forests. These are the Forest Department, Irrigation Department, Police and the Magistracy. Unfortunately, they have failed to fulfil their mandates and there is an urgent need for bringing about radical changes in these public sector institutions.

Farmers

Awareness needs to be created among farmers connected with the degradation that has already set in and the necessary steps needed to retard it. They need to be educated about the benefits of raising trees on their farmlands in order to lessen the burden on forests.

Local Communities

Poverty has increased over the last two decades. Social and economic welfare of a large part of the rural population is dependent on the cutting of forest trees, as well as on grazing and browsing. An alternative means of livelihood for them needs to be created by imparting necessary training in sericulture and apiculture.

FUTURE ACTION

While particular recommendations for future action are given separately for the various types of forests, the steps to be taken generally are given below.

For any headway to be made in the forestry department, a radical and revolutionary change in the system needs to be introduced with reward for good measures and retribution for unprofessional work. At present, there is no distinction between the worker endowed with a sense of responsibility and devotion to duty and those with a total lack of commitment. Lack of incentive is one of the major issues confronting the forest department.

Currently, all research in forestry is being carried out by the Silviculture Research Division at Miani and Mirpur Mathelo with one DFO and one RFO. The staff is insufficient to tackle these activities. A research institute,

complete with a library, a computer lab, and research fellows, on the lines of the Punjab Forest Research Institute Gatwala, needs to be established in Miani.

The official policy needs to be dynamic enough to adjust to changes in the pattern of wood consumption that has taken place due to rapid development in the province. The promotion of forest related industry must form a component of all present and future plans.

Agro-forestry seems to be the only feasible option to increase forest wealth. According to the assessment of the Chief Conservator of Forests, Sindh, 50 percent of the Sindh Forest Department is unproductive. This should be leased out on easy terms for a period of not less than 10 to 15 years. The government must also arrange loans for the development of land on easy instalments. The installation of wood seasoning, preservation and processing units will also help in enhancing the quality of wood and will increase utilisation of locally produced timber. In addition, whenever government wastelands are distributed among landless hari (peasants), the condition of planting a reasonable number of trees on the land allotted to them must be imposed.

The forests are shrinking very fast due to adverse climatic conditions, biotic pressure, and financial constraints, as well as requirement of land and water for production of food and cash crops. No new areas are likely to be earmarked for tree plantations. It is therefore necessary to adopt ways to motivate farmers and landowners through incentives and technical help to raise wind breaks and shelter belts on their lands.

The government needs to implement programmes to minimise environmental pollution and environmental hazards. These could be through: tree conservation and planting; developing a framework and programmes for establishing green wind breaks on arid lands to check erosion and desertification; establishing green areas in all cities with a population of 50,000 or more; reserving at least 25 percent area in new townships and industrial estates for use as parks, recreation spaces, and green belts; formulating, enacting and enforcing pollution

standards for emissions and discharge impacting the wildlife of protected areas and wetlands; and strengthening the capacities of relevant institutions to implement anti-pollution measures.

In the developing world, women are the main users of most forest resources such as firewood, grass and leaf fodder, leaf litter, medicinal herb and barks. In social forestry, the resources that are being created need careful protection, which is possible if women are involved in projects and are educated.

To deal with increased violation of forest laws, it is imperative for the department to have its own magistrates for speedy and effective disposal of offences pertaining to illicit cutting of trees and illegal encroachment of forest land.

To rehabilitate mangrove forests, a two-pronged approach needs to be adopted. Replanting in sparse areas while providing alternate sources for fuelwood and fodder will help reduce the dependence of the local people on these forests.

Social forestry needs to be encouraged for which the government needs to introduce some farmer-friendly policies such as:

- No water rate/ushr be charged from land under closely spaced plantations called hurries. (Most hurries of *babul/kikar* are on private farmland).
- *Babul* hurry growers need to be provided interest-free loans by government banks on easy instalments.
- Circular No. 481, dated 06.03-1858, issued by the Commissioner Sindh, Sir Bartly Frere, to his collectors for free grant of land up to four hectare to farming families in order to raise tree crops may be re-issued



Tahir Qureshi

Local grazer standing in a scrub forest

by the present government on the same conditions.

- Education and motivation programmes may be launched by the government in coordination with NGOs to impart technical know how on forestry and its importance.
- NGOs with their local orientation and integrated approach to rural development can promote community-based, participatory forestry programmes that benefit economically or socially disadvantaged groups. It has been observed that NGOs take on activities that government ministries or departments and aid agencies cannot or will not tackle by themselves.



CHAPTER 10

Wetlands



Often referred to as 'biological supermarkets' because of their extensive and rich food webs and biodiversity, wetlands are among the most productive ecosystems in the world. Since Pakistan is situated on the flyway to Central Asia and South Asia, the birds breeding in Central and Northern Asia, migrate through Afghanistan to the Indus Valley, particularly to the wetlands across Sindh which are major wintering grounds of migratory water birds.

Sindh's coastal and estuarine wetlands serve as spawning, rearing, and nursery grounds for the production of shrimp, lobster and fish. They also serve as critical breeding, rearing, staging and wintering grounds for a number of globally important fish and shellfish species. During the migration season, thousands of water birds from 108 species use this habitat. A detailed listing of these species can be found in **Appendix 10.1: Details of Bird Counts in Wetlands of Sindh**. The location of wetlands in Sindh is shown in Map 10.1.

The international community first came to know about the importance of Pakistan's wetlands when it became a signatory to the Ramsar Convention in 1976². The Convention, formed in 1971, is an intergovernmental treaty that provides a framework for national and international cooperation for the conservation of Wetlands. The Convention adopted an international definition for wetlands under Articles 1.1 and 1.2 that is currently accepted by 138 signatory countries³. In 1976, when Pakistan signed the Convention, the total covered area of wetlands of Pakistan was approximately 7,800 km and the number of internationally important wetlands was eight⁴. By 2003, this number grew to sixteen, six of which are located in Sindh.

The UN declared the year 2003 as the International Year of Freshwater. In this connection, three new wetland sites, all in Sindh - The Indus Delta (472,800 hectares), Rann of Kutch (566,375 hectares) and Deh Akro (20,500 hectares) have been listed, making the total number of Ramsar sites in Pakistan nineteen. These sites have gained importance due to their unique biodiversity and habitat which shelters a large number of species. The three proposed sites provide shelter to over 40 species of migratory water birds that come from the colder Central Asian regions to spend their winters in the comparatively warmer environment of the province. A list of Ramsar listed sites along with a list of other important wetlands in Sindh is

given in the tables in **Appendix 10.2: List of Wetlands in Sindh**. In addition, the Ramsar sites are described in Box 10.1: RAMSAR: Recognized Sites in Sindh. Refer to Map - 10.2: for the location of RAMSAR Sites in Sindh.

THREATS TO WETLANDS

It is important to understand that wetlands are not just environmental sites but possess significant economic importance. The local communities harvest several wetland species of fauna and flora for food and for economic gain. Sindh's wetlands feed an ever-increasing human population and a substantial dependent population of wetland species, both plant and animal. If wetlands suffer, then the people dependent on them are also adversely affected along with the interconnected ecosystem.

Prior to the construction of the Kotri Barrage in the 1950s, approximately 84 MAF of water and 225 million tonnes of sediment were discharged annually into the Indus delta. Since the damming of the Indus, approximately 100 million tonnes per year of sediment is discharged⁵. The low discharge of both sediment and water has had a negative impact, especially on the coastal wetlands. Since no sediment nourishment takes place, the rate of erosion increases coupled with seawater intrusion. At present, 60 percent of the total arable land is waterlogged. In addition to the rise in the water table, a number of localized low lying productive areas have been converted into seasonal or permanent wetlands, such as the areas in Badin and Thatta districts. Due to salinity and waterlogging, many locations have become so saline that they are unable to support any bird or plant life.

There is an inextricable link between agriculture, irrigation and wetlands. Some of the prominent wetland sites are reservoirs and dams that have become important for water bird habitats. However, these wetlands are now suffering because of ineffective management in

1. Mitsch, W.J. and Gosselink, J.G. 1993. *Wetlands Van Nostrand Reinhold*, New York, Second Edition
2. Savage, CDW. "The Wildfowl and Wetland Situation in West Pakistan" in Proceedings of Technical Meeting on Wetland Conservation, Ankara-Bursa-Istanbul, 9-16 October 1967, IUCN Publications New Series No. 12 122-128
3. www.ramsar.org
4. Scott, D.A., 1989. *A Directory of Asian Wetlands*. IUCN, Gland
5. G.R.Keerio, and M.A Bhatti. 1999. "Major Factors of Degradation of Indus Delta Mangrove Ecosystem." Proceedings of the National Seminar on Mangrove Ecosystem Dynamics of the Indus Delta, 1999: *Sea Level Rise: Possible Impacts on the Indus Delta*, IUCN, 1991

Box 10.1: RAMSAR: Recognised Sites in Sindh

The Indus Dolphin Reserve is spread over 135 km from the Sukkur upstream to the Guddu Barrage. In 1974, the entire area was declared the home of the endangered Blind Dolphin (IUCN Red Data Book). The major threats it faces include split populations of the dolphins due to dams and barrages on the River Indus, reduction in habitat size during dry season, high turbidity, pollution, and hunting. The number of dolphins at the site has increased from 150 in 1974 to 620 in 2001.

Keenjhar (Kalri) Lake is a large freshwater lake providing drinking water to Karachi. It is located in Thatta district. It was declared a Ramsar site in 1976 and later became a wildlife sanctuary under the Sindh Wildlife Protection Ordinance. An annual Waterfowl Census has been carried out since 1971. Some baseline information indicates 65 species of fauna whose number had increased from 50,000 to 150,000 in the 1970s to 205,000 in 1988⁶.

Major threats to the lake include illegal fishing operations, an excessive number of motorised fishing boats and the use of synthetic nets in the lake. The grazing of domestic animals and unchecked recreational activities are other significant threats.

Drigh Lake is a small, slightly brackish lake with extensive marshland. The lake was declared a wildlife sanctuary in 1972, and became a Ramsar site in 1976. Threats include diversion of water; and overgrown *Typha* and *Tamarix* resulting in increased grazing pressure. The number of wintering birds visiting the site has decreased over the years from 32,000 in 1973 to 17,400 in 1987-88.

Haleji Lake is a perennial freshwater lake with marshes and a brackish seepage lagoon. Considered a game reserve in 1971, this lake was declared a wildlife sanctuary and in 1976, the lake proceeded to become a Ramsar site. Haleji serves as an important source of water for Karachi besides being a popular recreational destination.

Threats to the site include the overlapping of the management of the lake by the Karachi Water and Sewerage Board (KWSB) and the Sindh Wildlife Department; the unauthorised and illegal fishing, hunting and cutting of trees and siltation, as well as eutrophication. The number of birds visiting the site was 60,000 to 100,000 in the 1970s. In 1988, the figure was 103,000.

Jubho Lagoon is a shallow, small brackish water lagoon with mudflats and marshes that support a large concentration of migratory birds including flamingos and endangered Dalmatian pelicans, a rare species in the world. This was declared a Ramsar site in 2001 because of the efforts made by IUCN Pakistan.

Nurruri Lagoon is also a brackish, privately owned lagoon with barren mudflats that is visited by large concentrations of migratory water birds. It was also declared a Ramsar site in 2001. Increased salinity, sea intrusion, population pressures, agricultural and industrial pollution are major threats to this site.

Deh Akro is a wildlife sanctuary consisting of four major habitats; desert, wetland, marsh, and agricultural. Located 330km northeast of Karachi, it is a natural inland wetland ecosystem, which supports a variety of rare and endangered wildlife species. This area hosts a considerable number of rare fauna. Many indigenous fish species are also found here. Water scarcity during a persistent dry spell is adversely affecting this area.

Runn of Kutch is part of the great Thar desert and comprises of stabilized sand dunes, with broad interdunal valleys of alluvial soil, connected across the frontier with India, which includes permanent saline marshes, coastal brackish lagoons, tidal mudflats, and estuarine habitats. The site supports many locally and globally threatened species, including the Great Indian bustard (*Choriotis nigriceps*), Houbara bustard (*Chlamydotis undulata*), Sarus crane (*Grus antigone*), and hyena (*Hyaena hyaena*) and supports more than 1% of the biogeographical population of flamingos.

Indus Delta is the fifth largest delta in the world. The fan-shaped delta consists of creeks, estuaries, mud flats, sand dunes, mangrove habitat, marshes and sea bays. It shelters 82,669 mangroves, mostly *Avicenna marina* which comprises 97% of the total mangrove area in the country and is said to be the largest coastal mangrove forest in the world. A large number of species of birds (including the threatened Dalmatian pelican) of fish and shrimps, and of dolphins (Plumbeous dolphin, Finless porpoise, and Bottlenose dolphin), humpback whale and reptiles are found here. The area is rich in archaeological and religious heritage.

Source: IUCN and RAMSAR

6. D.A Scott., 1989. *A Directory of Asian Wetlands*, Gland, IUCN

the catchment areas where forests are being harvested at an unsustainable rate (seven to nine km per year). As a result, loose topsoil is washed into the river systems and silting of the catchment areas occurs, reducing the life span of dams and reservoirs.

Natural wetlands such as the Indus Delta are also suffering because excessive use of water for agriculture deprives them of their share. Small wetlands created by the seepage from irrigation systems are targeted for use as agricultural land⁷. The water that does reach the natural inland-located wetlands is drained from agricultural land and carries silt, fertilizer, and pesticide runoff, causing additional problems of silting and eutrophication. Haleji Lake, an artificial wetland, is presently facing the problem of eutrophication. The lake is rich in nutrients and supports a dense plant population; however animal life is threatened by a lack of oxygen⁸.

The other major threats to wetlands are hunting, unplanned growth of human

settlements, disturbance from recreation and reclamation for urban and industrial development. Mai Kolachi is an example of this phenomenon. The coastal wetlands of this region are habitats for shrimps, various species of fish and birds. The area has been reclaimed for city expansion, adversely affecting the fishermen of Baba Bhit who have inhabited the region for centuries. Potable water supply to urban centres is provided by some of the wetlands such as Haleji Lake, which has been harnessed as a freshwater resource for Karachi. Wetlands are also threatened by catchment degradation, soil erosion and siltation.

Over the years, seepage from agricultural lands and the canal irrigation networks has formed many artificial wetlands that have become important for migratory birds such as cranes and ducks. Waterlogging and salinity affect many of these wetlands to an extent where they can no longer support animal and bird life. The adverse effect of the LBOD and the RBOD on the wetlands of Sindh is



Sana Raza

Birds at Haleji Lake in Thatta District

7. Pakistan's Wetlands Action Plan. WWF
8. Ibid



Dilapidated boat houses at Manchar Lake

discussed in Chapter 12: Flora of Sindh⁹.

Manchar Lake, once the largest freshwater lake in Asia has suffered the same fate. Approximately ten thousand people inhabited areas surrounding it. The devastation caused to it due to agricultural pollutants, forced the locals to move to other parts of Sindh. Agricultural pollutants from Upper Sindh and Lower Punjab were drained into it through the Main Nara Valley Drain. The waterlogged and saline water blended with the freshwater that was once used for agriculture and fishing, depreciating the quality of water to an extent that it was no longer being used for the same purposes.

Over the past years, many wetlands have been degraded and have lost their significance due to unsustainable exploitation, increased levels of urban and domestic effluent discharge into the aquatic environment, and drought-like conditions prevailing in the province. The Nurrurri Lagoon is confronted with these problems. The land provides livelihood to about 3,000-4,000 people in surrounding villages,

chiefly through fisheries. Invasive species, such as *Typha* and occasionally *Tamarix*, are seen to be hindering the growth and diversity of native flora, and population pressures, including accelerating agricultural and industrial pollution, offer challenges.

Wetland areas have decreased due to the over-exploitation of their resources by the local communities. As the human population continues to grow, it will contribute significantly towards the process of biodegradation. It is only recently after ecological and environmental surveys that some awareness regarding the importance of wetlands has been created. One of the causes of degradation of Kalri Lake is the influx of tourists in the area combined with inadequate maintenance of the area. The poor supply of water from K.B Feeder also affects the lake.

EMERGING TRENDS

Wetland conservation receives a minuscule amount of monetary support from the

9. Khurshid, N. 1991. "A Step Towards Wetland Conservation: An Overview of Pakistan's Wetlands with Action Plan" LBOD EIA Report. WWF-Pakistan, Lahore



Dead fish at the bank of Manchar Lake

government because it is viewed as a low priority area. The value that the government or local communities living in and around wetlands give to them is based upon the immediate benefit they derive in terms of income and livelihood. However, this is a myopic, short-term perspective that overlooks sustainability of these sites.

Many development institutions view the elimination of wetlands as a small price to pay for the benefits of their reuse for other activities such as agriculture¹⁰. However, much of this conversion of resource use has resulted in great hardship for populations dependent upon such areas. Dams and other river basin schemes have damaged the ecology of Sindh creating many social, environmental, economic and political problems.

NGOs have played a major role in supporting and directing government efforts to improve wetland conservation. The World Wildlife Fund for Nature (WWF)-Pakistan initiated its Wetland

Conservation Programme in 1989. IUCN Pakistan too, has been active in conservation efforts since its establishment in 1984, and has played a key role in the development of wetland programmes in Pakistan to safeguard habitats and protect biodiversity. IUCN Pakistan has also been involved in the implementation of a number of mangrove conservation projects since 1987.

More recently, remote sensing techniques have been applied on the monitoring of wetlands. Space and Upper Atmospheric Research Organisation (SUPARCO) is using satellite imagery for obtaining relatively precise information on the estimates of spatial extents and surface area which can effectively be linked to data on seasonal variation, weed cover, vegetation cover and environmental degradation. Similar techniques to observe the changes that have taken place on some of the *dhands* have shown that the boundaries of the waterbodies have altered over the years to form a single source¹¹.

10. Dugan, P.G. 1990. *Wetland Conservation: A Review of Current Issues and Required Action*. IUCN. Montreux

11. Mathrani, M; Usani, H.R. and A. Memon, *Environmental Impact of Seawater Intrusion around Tidal Link Using Satellite Imageries and GIS* presented at the International Seminar on Natural Hazards Monitoring, January, 2002, Karachi, Pakistan



Crocodiles at a hatchery in Haleji Lake

STAKEHOLDERS

Role of Government Organisations

Wetland conservation is on the agenda of the federal and provincial governments and NGOs. However, a comprehensive strategy or legislation exclusively pertaining to this issue has not been developed. Wetlands and waterfowl conservation is a provincial subject in Pakistan and is overseen by the respective provincial wildlife or forest departments.

Ministry of Environment, Local Government and Rural Development

This ministry is a federal government institution and is responsible for formulating and implementing federal policies related to biodiversity. It is also the focal point for various conventions relating to biodiversity or the environment, to which Pakistan is a signatory. The Government of Pakistan has promulgated

the Pakistan Environmental Protection Ordinance 1997 and the provincial wildlife departments are the implementing bodies for environmental legislation or policies.

The National Conservation Strategy (NCS), launched in 1992 by the Ministry of Environment, has achieved some success and is being jointly implemented by the government, some NGOs and members of civil society. The NCS analyses Pakistan's environmental problems and offers recommendations for the successful implementation of the policy. The goals of the NCS are conservation of natural resources, sustainable development and greater efficiency in the use and management of resources.

National Council for the Conservation of Wildlife (NCCW)

The NCCW is a department of the Ministry of Environment, Local Government and Rural Development. It is mandated to represent the government and present the Country Report to the RAMSAR Convention and liaise with other conventions and international agencies, as well

as coordinate its work with the provincial governments in matters of wildlife conservation. In 1996, the NCCW formed a Wetland Management Committee on behalf of the Government of Pakistan with the participation of all provincial wildlife departments, the Zoological Survey Department and some NGOs.

The Zoological Survey Department (ZSD)

The ZSD is a federal department under the Ministry of Environment, Local Government and Rural Development (LG&RD). It is responsible for conducting surveys and research on wildlife, wetlands and waterfowl. The department undertakes annual bird counts at important wetland sites.

Sindh Wildlife Department (SWD)

The SWD is a custodian of wildlife in the province of Sindh and is responsible for the management of habitats including wetlands. The department manages the RAMSAR sites

and implements decisions taken by the federal government for the management of these sites.

The Water and Power Development Authority (WAPDA)

WAPDA, within the Ministry of Water and Power, is responsible for: the development of water resources and the supply of irrigated water; prevention of waterlogging and reclamation of waterlogged and saline lands; drainage and flood control; generation, transmission, and distribution of power; and land navigation. It undertakes policy implementation as a federal government agency that oversees and manages reservoirs and link canals. As WAPDA owns and manages many important man-made and natural wetlands, it plays a significant role in wetland management and conservation.

National Wetland Management Committee (NWMC)

The formation of the NWMC in February 1996 by the National Council for the Conservation of



Muhammad Anees Shehzad

Little Egrets at Lugh Lake



Terns at Haleji Lake

Wildlife within the Ministry of Environment, Local Government & Rural Development is an important step. This committee includes relevant government departments, provincial wildlife departments, and NGOs. The primary idea behind its formation was to provide a focal point for networking between relevant federal and provincial departments and NGOs, as well as the need to develop a National Wetland Strategy/Policy. It also deals with local wetland issues and problems.

Non-Governmental Organisations (NGOs)

Currently, there are two international NGOs working in the field of wetland conservation in Pakistan:

World Wide Fund for Nature-Pakistan (WWF-Pakistan)

WWF-Pakistan has a wetlands conservation programme targeting freshwater and coastal ecosystems throughout the country. Its current

Wetland Conservation Programme was initiated in 1989.

Under the National Wetland Programme a "Wetland Action Plan" was developed in 1991. The action plan is aimed at summarising the threats faced by wetlands in Pakistan to government agencies and highlighting the impact of loss of various functions that the wetlands provide.

IUCN Pakistan

IUCN has been active in wetland conservation since its establishment in 1984. Its activities include the rehabilitation of mangrove forests in the northern Indus Delta and the Korangi ecosystem project in collaboration with the Sindh Forest Department. IUCN Pakistan is also involved in the National Conservation Strategy being implemented jointly by the government, NGOs and members of civil society which also has a wetland component. In collaboration with the Zoological Survey Department, IUCNP got eight RAMSAR sites declared in Sindh and Balochistan in 2001.

Legislation

Wetland Legislation

Each province has its own provincial wildlife protection act. For the province of Sindh, it is the Sindh Wildlife Protection Act 1972, revised in 1996.

International Conventions

Pakistan is a party to a number of international conventions including the Convention on Wetlands (RAMSAR); International Convention on Migratory Species (CMS); Convention on Biological Diversity (CBD); Convention on International Trade on Endangered Species (CITES) of Flora and Fauna.

FUTURE ACTION

Stakeholders play a pivotal role in the effective implementation of existing Wildlife Acts for the protection of species and habitats. Good governance is vital for the desired implementation. Positive results can be achieved if the responsibilities for implementation are clearly defined, along with supportive policies, rules, legislation and institutional reform. Monitoring with a feedback system can provide indicators that determine the success/failure of the management strategy. Baseline information established through qualitative and quantitative surveys is also a requirement. Accessibility of information and reliable tools would make the monitoring process more accurate and useful.

There is a clear need to resolve overlaps and conflicting issues between the various government and non-governmental agencies and to review the location of responsibilities and recommend measures that will benefit the management of wetland resources.

The National Wetland Management Committee established by the Ministry of Environment in 1995 needs to be reactivated and recommendations made in the NEQS need to be implemented to avoid the use of wetlands as dumping sites. The hunting legislation is also in

need of a review and its implementation ensured.

The Pakistan Wetland Action Plan was developed by the Ministry of Environment and WWF-Pakistan in 2000 and needs to be implemented.

The current conservation policies on natural resources are framed by the Government of Pakistan in the Ministry of Environment, LG&RD. The most recent conservation policies of the Government of Pakistan regarding the management of natural resources are the following:

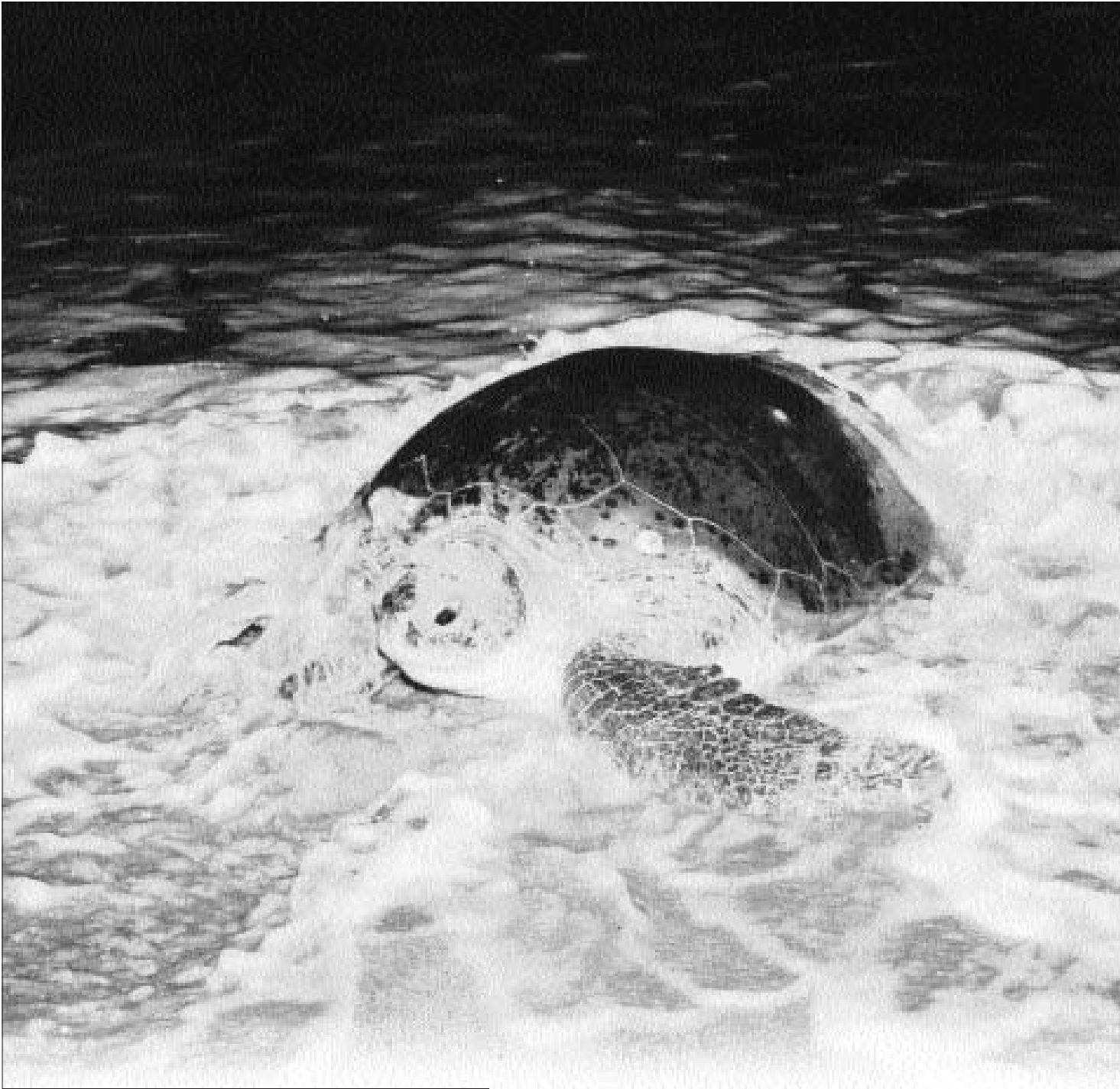
- Conserving biological diversity and maintaining ecological balance
- Containing environmental degradation in the watersheds
- Promoting income generation and self-employment in the rural areas
- Promoting NGOs and private voluntary organisations to create public awareness
- Integrated and participatory management of natural resources

The National Conservation Strategy (NCS 1992) further emphasised the need for the following measures:

- Maintaining essential ecological processes
- Preserving the biodiversity of natural resources to restore degraded natural resources cost-effectively
- Ensuring sustainable use of natural resources
- Ensuring balanced and diversified development that maintains, if not increases, the sum of options available to future generations
- Improving the efficiencies with which natural resources are used
- Giving priority to preventing deterioration of the fragile ecosystems with large downstream effects

These policies will require tremendous resources and a great deal of time for implementation. The implementation of the NCS is to be initiated through launching programmes for protecting watersheds, forestry and plantations, restoring rangelands and improving livestock; protecting biodiversity and supporting capacity building both at the

institutional as well as at the professional level. These efforts can only be achieved if funds are available and through the participation of community based conservation groups. The programme is ambitious and as such difficult to implement. Therefore, it is necessary to set clear priorities related to the availability of financial and human resources.



CHAPTER 11

Coastal and Marine Ecosystem



Pakistan's coastline is 1046 kilometres long and the Exclusive Economic Zone (EEZ) covers an area of about 240,000 km². The maritime zone of Pakistan, including the continental shelf, extends up to 350 nautical miles from the coastline. The Indus Canyon in the east dominates the coastal shelf, which is flat and soft, and stretches deep into the ocean.

DESCRIPTION AND PRESENT SITUATION

The coastline of Pakistan lies in the provinces of Sindh and Balochistan and is shown on Map 11.2. The part of the coast in Sindh is approximately 350 km, while the one in Balochistan is 700 km. The two coasts have different climatic and physical characteristics. The Sindh coast is at the tail end of the southwest monsoon, and the Balochistan coast has a Mediterranean climate.

PHYSICAL CHARACTERISTICS

The Sindh coast can further be subdivided into the Indus Delta/creek system and the Karachi coast. The Sindh coastal region is located in the southeastern part of the country between the Indian border along the Sir Creek on the east, and the Hub River along the Balochistan coast on the west. The Indus drains through approximately 300,000 sq. km of the Indus watershed, of which 50 percent are located outside Pakistan: in India, China, and Afghanistan. The Indus Delta (2,560 sq. kms)² is the most prominent ecological feature of the coast and covers 85 percent of the coastal belt³. Map 11.2 is a map of the Indus Delta and Map 11.3 shows a satellite image of the Delta. The coastal morphology is characterised by a network of tidal creeks and several small islands with scattered mangrove vegetation which constitute the largest arid land mangroves in the world and the thirteenth largest mangrove forests in terms of coverage.

Cyclones on the Sindh coast are not common but do occur periodically causing considerable damage to coastal villages. After 1947, major cyclones occurred in June 1948, November 1993, and in May 1999.

Situated between the Indus Delta on the southeast and Hub River on the west, the Karachi coastal belt is about 100 km in length⁴. Most of which, with the exception of scattered patches of mangroves, is devoid of any kind of vegetation and consists of shallow lagoons, sea cliffs, stacks and terraces, wave cut platforms, sea caves and notches. The Lyari and Malir Rivers flowing through Karachi are non-perennial in nature and drain into the Arabian Sea. They carry substantial quantities of untreated urban, municipal and industrial effluents.

The coastal waters have high salinity (>36 percent)⁵ due to high evaporation rates, combined with negligible rainfall. Oxygen-poor water layers sometimes rise to the surface along the coast, leading to fish mortality. The wildlife along the Pakistani coast consists of both marine and terrestrial species.

Land Use

The Indus deltaic coast is sparsely populated with small fishing communities living along the creeks. Neither major infrastructure development nor significant commercial industrial activities have been cultivated in these areas. The most prominent ecological feature is the mangrove forest. Karachi, on the other hand, is the main commercial and industrial centre of Pakistan, encompassing two deep-sea ports, several fish harbours, jetties and a developed urban infrastructure. A naval facility and a shipyard are also located along the Karachi coastline as are several power plants.

Biodiversity : Ecosystem, Habitats and Species Diversity

The main habitats for migratory birds and other waterfowl are wetlands, estuaries and lagoons. The vegetation is dominated by mangrove forests of which eight species have

1. United Nations ESCAP in Cooperation with Environment and Urban Affairs Division, Government of Pakistan / National Institute of Oceanography, Government of Pakistan - 6390 - Coastal Environmental Management Plan for Pakistan
2. Ibid
3. Ibid
4. Ibid
5. Dr. Hein Van Gils, M. Shabbir Baig, LARUS-HC, Netherlands, EU-SSP, Pakistan- 6392 - Environmental Profile of Balochistan, Pakistan



Vegetation along the coast is dominated by mangroves, of which eight species have been documented

been documented with *Avicennia marina* being the most abundant (95 percent)⁶. The forest covers an area of 200,000 hectares in Korangi, Phitti, Wadi, Khudi, Khai, Patiani, Dabho and Bhuri creeks of the delta system in the west and in Kanjher, Pakhar and Sir Creeks in the east. This ecosystem provides a rich habitat for wildlife of terrestrial and marine origin.

The mammals of the mangrove forest in the Indus Delta include tropical dolphins, tortoises, jackals and occasional visitors such as toothed whales. Scant information is available on reptiles however three species of lizards, one species of poisonous snake and two species of marine snakes have been reported. In addition, about 200 species of fish have been reported from the delta area⁷.

The Indus Delta with its coastal wetlands attracts a number of migratory birds, particularly waterfowl. In all, 56 species of birds belonging to 6 orders and 14 families are found along

Sindh's coastal waters. Some of these birds are residents and others are migratory in nature. The Green Turtle (*Chelonia mydas*) and Olive Ridley Turtles (*Lepidochelys olivacea*) inhabit the shores of the Karachi coastline where they come to nest⁸.

The coast of Pakistan sustains seaweed resources which increase in the post southwest monsoon period. The coastal waters are particularly rich in sardines and anchovies.

The inter-tidal habitats of all protected muddy and sandy beaches and of salt water creeks and backwaters swarm with mud skippers. On exposed rocky shores, gastropod molluscs dominate, followed by decayed crustaceans. The shrimp, crab and lobster fauna consists of about 25 species of Penaeid shrimp, three species of spring lobster and three species of edible crabs. Shrimp are the most important commercial food source in the delta and in the shallow benthic coastal waters.

6. United Nations ESCAP in Co-operation with Environment and Urban Affairs Division, Government of Pakistan/National Institute of Oceanography, Government of Pakistan - 6390 - Coastal Environmental Management Plan for Pakistan

7. Ibid

8. Ibid

Coastal Ecosystem: Identification of Micro Regions with Specific Habitats

In addition to the RAMSAR Sites discussed in Chapter - 10 (Wetlands), a number of areas along the Karachi and Sindh coast also support sensitive ecosystems. These are discussed below.

Sandspit Backwaters

Sandspit, an open sea front located 18 km south-west of Karachi city, is a popular public beach. Two fishing villages are located in the area (population 5,000). It contains shallow tidal lagoons, inter-tidal mudflats, and 1640 ha of mangrove swamps. The area is sandy along the seacoast and becomes muddy as it extends into the backwaters.

Avicennia Marina is growing naturally in the back waters of Sandspit and IUCNP reintroduced *Rhizophora mucronata* and *Ceriops tagal* in artificial plantation in 1977.

About 50,000 species of waterfowl such as waders, pelicans, flamingos, egrets, herons, gulls and terns use the area as a wintering ground and Ardeids breed in the area. Two species of turtles, Green Turtle and Olive Ridley, use the beach as a nesting ground.

Karachi Harbour Backwaters

These include the Chinna Creek and Boating Basin backwaters. This area represents a unique backwater coastal ecosystem consisting of wetlands and mangrove forests. It has a good potential for recreational development.

Indus Delta Creek Mangrove Ecosystem

The Indus delta consists of a network of 17 major and several minor creeks and mangrove islands in three districts of Sindh, namely Karachi, Thatta and Badin⁹. Almost all human settlements are on the islands located between the channels. Productive activities in the



IUCN

Aerial view of Indus Delta

9. Sindh Forest & Wildlife Department and The World Bank - June 14-16, 6399 - Proceedings of the National Seminar on Mangrove Ecosystem Dynamics of the Indus Delta



Oil Tankers traffic at the Karachi Port. Karachi has two deep sea ports: Karachi Port and Port Qasim

coastal areas can be divided into three broad classifications. Fishing and related activities (in which an estimated 90 percent of the population is involved), reference agriculture and forestry as well as the services sector, which employs 8 and 2 percent of the population, respectively¹⁰.

Regulatory Bodies

Regulation and control (registration/authorising use of landing sites) of the fishing industry is maintained by the Marine Fisheries Department at the federal level, and by the Sindh Fisheries Departments at the provincial level. The Karachi Fish Harbour Authority and Korangi Fish Harbour Authority operate separately. Fishermen's Cooperative Societies have also been formed at the provincial levels and for Karachi. They manage the sale of farmed fish and offer a forum for conflict resolution. Recently, a National Fisheries Development Board was established to initiate a process of capacity building of the fishing communities and for the sector at large.

The forestry sector is also regulated at the federal and provincial levels. Control and jurisdiction of the activities undertaken along the Karachi coastline, including shipping and trade, are shared by a number of federal, provincial and local agencies and institutions, including the port authorities, the provincial government, local government and urban cantonments.

Threats to Marine and Coastal Areas

The beaches and coastal waters of Sindh are relatively free of man-made pollution, except at the harbours, urban discharge points and waterfront development sites. Because there are no industries or dense populations along the coastal belt, there is no large scale pollution except along the Karachi coastline. However, projects both in Sindh and Balochistan such as the Gwadar Deep Sea Port, Mirani Dam, construction of jetties/villages, coastal highways, and the

10. United Nations ESCAP in Cooperation with Environment and Urban Affairs Division, Government of Pakistan / National Institute of Oceanography, Government of Pakistan) - 6390 - Coastal Environmental Management Plan for Pakistan

mining of coal in Thar (Sindh), and copper/gold in Saindak (Balochistan), are likely to result in the growth of human settlements along the coast.

Coastal Pollution

Industrial/Urban Pollution

Seventy percent of the total industry of Pakistan is located in Karachi and in the Bin Qasim Industrial Area adjacent to it. Most of this is located in the Sindh Industrial Trading Estate (SITE), Landhi Industrial Trading Estate (LITE), Korangi Industrial Area, and West Wharf Industrial Area.

The Sindh Industrial Trading Estate covers an area of about 1600 hectares and houses 2500 industrial units. They discharge 69 MGD¹¹ of effluents that carry pollutants including heavy metals, organic matter (including benzene and toluene), oils and greases, and other toxic

chemicals. The effluents are discharged untreated into the Lyari River which drains into the Arabian Sea through the Karachi harbour. The river also carries calcium, alum, sulphates, magnesium, sodium, potassium, arsenic, halides and bicarbonates. SITE is responsible for about half of the total industrial polluted discharges of Karachi. For details regarding the types of pollutants and their extent see Tables 1 and 2 in Appendix 11.1: Major Pollutants and Their Load in the Industrial Waste from the Karachi Region.

Landhi Industrial Trading Estate and the Korangi industrial area discharge their effluents (23 MGD)¹² to the mangrove mud flats of Korangi Creek. This effluent is from the tanneries of Korangi, the National Oil Refinery, and the Pakistan Oil Refinery.

Karachi Steel Mills discharges between 550 to 750 m³/hr of heated wastewater after its use in the mills, directly into the Gharo creek¹³. This adds to the thermal pollution of ocean waters.



Muhammad Anees Shehzad

Percupine Fish found on the coast of Karachi

11. United Nations ESCAP in Co-operation with Environment and Urban Affairs Division, Government of Pakistan/National Institute of Oceanography, Government of Pakistan) - 6390 - Coastal Environmental Management Plan for Pakistan

12. Ibid

13. Ibid



Industrial Pollution: Effluent being discharged into Lyari River which drains into the Arabian Sea

Many other large industries such as Sindh Alkali, ICI/PTA and Export Processing Zone Authority (EPZA) are part of LITE. In addition, there are three power plants along the Karachi coast: Karachi Nuclear Power Plant, Korangi Thermal Power Plant and Bin Qasim Power Plant. These facilities use huge quantities of seawater for cooling and discharge heated effluent and other pollutants into the ocean. This discharge contains chlorine used for the control of bio-fouling organisms in the plants.

Another source of thermal pollution is the Karachi Nuclear Power Plant (KANUPP) located 18 km northwest of Karachi. It is a 137 MW heavy-water modulated and cooled, natural uranium horizontal tube reactor. About three-fourths of its heat is released to the sea through a long effluent channel¹⁴.

Comprehensive data or analysis linking the effect of industrial and urban discharges on the flora and fauna and other aspects of the coastal ecosystems is not available.

Dumping of Solid Waste

Due to lack of adequate sanitation facilities, solid waste generated in the small coastal towns and villages, as well as a significant portion of the municipal and industrial waste of Karachi, is dumped along the coast. This is flushed into the coastal ecosystems at high tide. Urban Karachi generates about 8,000 to 10,000 tonnes of solid waste per day. Approximately 60 percent of this waste remains uncollected and is either burnt or deposited directly into storm drains or coastal rivers which ultimately transport it to the coastal waters. This is one of the major causes of the reduced aesthetic and recreational potential of the coastline. Components of waste, such as plastic bags, are known to damage mechanised fishing crafts and harm marine life. This is a problem that is growing in magnitude and could increase if the coastal areas are developed without planning for the effective management and disposal of solid waste.

14. UNEP Regional Seas Reports and Studies No. 77 - 6386 - Environmental Problems of the Marine and Coastal Areas of Pakistan, National Report



Industrial and domestic pollution being discharged into the Arabian Sea through the Lyari River

Pollutant Discharges via Terrestrial Streams

Outfall drains also bring runoff from agricultural fields to the coastal waters. Agricultural pollutants such as pesticides, herbicides and fertilisers carried by the drains have adverse impacts on the coastal ecology.

In Pakistan, salinisation and waterlogging are particularly acute in the Indus Valley, which is irrigated by the Indus River Irrigation System¹⁵. Remedial measures to control salinity were initiated in 1958 through the Salinity Control and Reclamation Project (SCARP), which are ongoing. Non-saline water areas are pumped in order to ameliorate waterlogging problems. The saline water of the Punjab and NWFP provinces is dumped directly into the Indus, while two large outfall drains, namely the LBOD and the RBOD, carry the saline water of Sindh province. The LBOD discharges into Shah Samdoo creek through a tidal link which adversely affects the coast. RBOD presently discharges into the

freshwater Manchar Lake in the middle of Sindh province.

It has now been decided to divert the RBOD discharge to the sea near Gharo Creek, which is already strained due to heavy industrial and port activities. Groundwork for the project is underway. This is considered a major pollution threat to coastal ecology, but no data is presently available indicating the exact make-up of the RBOD discharges. An EIA has not been initiated either, as required by environmental legislation.

Oil Pollution

About 2,500 ships and 200 oil tankers visit the Karachi harbour through the Manora Channel annually and some 20 million tonnes¹⁶ of cargo is handled as a result. There is large scale shipping traffic at Port Qasim. The sources of oil pollution in Manora channel are bilges, washings from engine rooms of vessels, discharges and leaks from bunkering points, and leaks and small

15. Directory of Asian Wetlands

16. United Nations ESCAP in Co-operation with Environment and Urban Affairs Division, Government of Pakistan/National Institute of Oceanography, Government of Pakistan) - 6390 - Coastal Environmental Management Plan for Pakistan

spills occurring during loading and unloading at oil piers. Some oil is also brought to the channel through the Lyari river discharge. It is estimated that all the sources of oil pollution in the Karachi harbour contribute about fifteen to twenty thousand tonnes¹⁷ of oil per year within the

harbour and adjacent waters connected with it through the Manora channel. Oil pollution also occurs due to the National Oil Refinery and Pakistan Oil Refinery discharges into Korangi Creek. Apart from this, the Sindh coastline appears to be relatively free from oil pollution.

Box 11.1 : The Tasman Spirit Oil Spill

The Spillage

On the 27th of July 2003 an oil tanker, *Tasman Spirit* grounded the channel of the port of Karachi. The vessel was carrying a cargo of 67,535 tonnes of Iranian crude oil for delivery to the Pakistan Refinery Limited (PRL). During the eve of August 13th the tanker broke and significant quantities of oil leaked into the ocean. Over the course of five days, 27,000 tonnes of cargo had been lost. On the 22nd of August further structural collapse led to a supplemental discharge of approximately 100 to 200 tonnes of oil. On August 29th and September 4th further releases of oil were reported. Therefore, a series of oil spills over a period of three weeks commencing from the 27th of July occurred rather than just one leakage. Altogether, 40km² of the sea bed was covered with oil residue.

Resources at Risk

The coastal environment in which the *Tasman Spirit* oil spill occurred is a rich and diverse tropical marine/estuarine ecosystem. It includes extensive mangrove forests (dominated by *Avicennia marina*); habitats for Green and Olive Ridley sea turtles, dolphins, porpoises, beaked whales and several species of lizards and sea snakes. About 200 species of fish and various species of crustaceans including shrimp, crab and lobster exist in the region. These are important components of the marine food web and vital for artisanal and commercial fisheries. Over 50 species of birds, some migratory and some resident, utilise the area as a resting ground. Geographically, the area consists of tidal estuaries, river and creek systems, mudflats, sand beaches and relatively shallow offshore marine waters with moderate current speeds and turbulent mixing.

To the west of the grounding site are turtle nesting sites along Hawkesbay and Sandspit. Within the port of Karachi lie Pakistan Navy installations, oil terminals, salt ponds, mangrove forests and an artisanal harbour mainly for shrimp fishing as well as shipyard facilities, which are all potentially sensitive to oil contamination.

To the east of the grounding site are mangrove forests, which are vital for the ecosystem and serve many purposes. They are land stabilisers and have an extensive root system that binds the soil preventing soil erosion, deforestation and contribute to sustainable development. The firmly rooted mangroves serve as hatcheries for the larvae of fish and other marine life forms that dwell in these waters and subsist on them. These forests serve as resting grounds for more than 60 species of birds.

Clifton Beach, a popular recreational spot that houses several restaurants and facilities for the public, was severely affected. This beach is visited by many people everyday and a residential area exists along the beach. Under prevailing weather conditions 11,000 tonnes of volatile organic compounds (VOC) evaporated causing air pollution. Local residents were exposed to 40-170ppm VOC for 15-20 days.

Response to the Oil Spill

Efforts were focused on the use of dispersant and booming to keep the oil away from reaching the oil piers in the port, and skimming and manual clean up of the beach and the floating oil debris in the port. DHA, City District government and KPT workers cleaned the Clifton Beach area through manual methods followed by periodically ploughing the affected beach at low tide. Clean up operations continued till a few months after the spill.

Source: IUCN Pakistan

17. Ibid



Tasman Spirit, an oil tanker carrying over 60,000 tonnes of crude oil, ran aground on 27th July 2003 and caused a major oil spill disaster on the coast of Karachi

Among the creeks of the Indus delta, Gizri Creek and Korangi Creek are most affected by oil pollution from the waste oil discharges of refineries, industries and municipal activities of sources located in the Korangi area.

New oil fields are being explored in district Badin in the south of Sindh province. The Government of Pakistan has also recently prepared an Offshore Drilling Policy and concession rights have been issued in the Indus delta. These developments may increase oil pollution considerably.

No comprehensive data on the impact of oil pollution on the coastal ecosystems exists. However, the Pakistan Maritime Security Agency has prepared a National Oil Spill Disaster Contingency Plan for tackling the problem of oil spills. Agencies like the Karachi Port Trust (KPT) have acquired related equipment for it. See Box 11.1 for an excerpt on the Tasman Spirit Oil Spill.

Sediment Transport

According to some estimates, the increased level of coastal erosion found along the

coastline may be attributed to the reduction in the sediment load reaching the coast through the Indus River.

Turbidity in the coastal waters of Pakistan, particularly in the saltwater creeks, is high. An important feature of the Indus delta is that it receives the highest wave energy of any river of the world. During the southwest monsoon the Delta front receives more wave energy on a single day than the Mississippi delta receives in an entire year. Erosion effects of wave action were previously balanced by high discharges from the Indus which have now been substantially reduced. Thus wave energy causes severe erosion in some areas. It seems that sediments are brought into the creeks from the corrosion-prone open coast beaches as well as through small rivers and inlets.

At Karachi, the Lyari River discharges considerable amounts of suspended matter into the Manora channel throughout the year. Part of this settles at the bottom and may be responsible for the chronic siltation problems the channel suffers, owing to which, it has to be dredged throughout the year.



Overcrowding at the Karachi Port

Port Operations

Significant pollution risks are associated with port construction and operations. Dredging is a major activity involving sediment transport which is carried out constantly along the port area in Karachi. Dredging takes place during the development of new harbours and ports, for their extensions and to maintain the depth of channels, dock entrances and estuaries. Dredging is required annually for removing about 500,000 m³ of silt and sand which gets deposited in the navigational channel of Karachi harbour during the monsoons¹⁸. Debris and material removed by dredging operations are dumped about 50 nautical miles south of Manora breakwater wall or in the open sea¹⁹. Dredging activities also take place in Port Qasim.

Coastal Land Use Change

The coastal development plan for the Karachi prepared by the KDA in 1987 exists to date.

However, development along the coast does not follow the plan requirements, in fact, is carried out in violation of it. This development comprises of both formal housing and recreation projects; the creation of unauthorised fishing villages as well as informal settlements. The impact of these activities on the coastal ecology/hydrology has not been documented. However, the coastal profile is highly disorganized in the absence of proper land management.

Land reclamation activities are limited to the Karachi coast where land is reclaimed in the harbour area for port management related activities and in the urban cantonments for housing, commercial and recreational projects. These activities have resulted in severe erosion along the coastline due to turbulent wave action. The progressive disappearance of Bundal Island in the Korangi Creek area can be attributed to the altered coastal hydraulic regime due to the land reclamation carried out by the Defence Housing Authority (DHA) and the channelling of access creeks to Port Qasim.

18. Ibid
19. Ibid

CAUSES FOR COASTAL ENVIRONMENTAL CONDITIONS

Currently, neither an umbrella national legislation to protect coastal and marine resources in general nor in any specific area of ecological significance exists. However, relevant programmes on wetlands under the Ramsar Convention and Pakistan National Conservation Strategy do cover and protect some of the coastal ecosystems. Over 260,000 hectares of mangroves forests were declared as protected areas in 1958 and the wildlife of the Indus delta is protected under the Sindh Wildlife Ordinance, 1972.

An extensive administrative framework of local, provincial and federal agencies operates along the Pakistan coast but there is no coordination between them. To most of them, conservation is not a priority even though in recent years many of their staff have attended nationally and internationally organized forums and seminars on environment-related issues.

In the absence of legislation, designated responsibilities, appropriate well-defined procedures and the means of institutional capacity building, management of marine and coastal areas is difficult if not impossible. NGOs, such as IUCN, WWF, Shirkat Gah, are involved in this sector and have developed model conservation projects with the cooperation of local coastal communities but the constrained resources of NGOs can only have a limited impact without support from state institutions.

The Environmental Protection Act, 1997 and the NEQS serve as the main legislative and regulatory instruments in Pakistan, but they do not specifically address the issue of coastal pollution. For example, there are no provincial or federal laws that explicitly aim to protect marine resources against possible damage due to the reduction of freshwater flows through the Indus delta.

Data Availability and Reliability

Various organisations, both governmental and non-governmental, are engaged in research



Sindh Agriculture Information Department, Hyderabad

Karachi Port: Dredging is required annually for removing the silt and sand that gets deposited in the navigational channels

and documentation related to the various aspects of coastal ecology and environment. However, these efforts are not coordinated to specifically address the coastal zone's ecologically sensitive areas as a composite ecosystem. As a result, information about any particular zone or area of ecological importance is available only in bits and pieces and the dynamics of the coastal ecosystems are not properly understood or addressed. Tools and equipment required for the testing and analysis of the coastal zone ecology and environment on a long term, scientific basis are inaccessible. These factors are a major constraint on environment-related research, planning and implementation.

Policies, Legislations, Jurisdiction and Enforcement

The presence of a multiplicity of agencies, institutions and organizations involved in the management of the coastal regions of Sindh, particularly in Karachi and its surrounding areas, hinders the development of coordinated policies and plans for the coastal region. Neither an administrative framework dealing specifically with coastal and marine resource management, nor relevant legislation and regulations, has been established so far. Moreover, a coordinated plan for Sindh's coastal regions has never even been proposed or discussed. An important aspect of such a plan would be measures to prevent any further loss of discharge to the delta region from the Indus which is causing sea intrusion. Damaging social, economic and ecological repercussions are expected because of the incurring loss of fauna and flora due to this phenomenon.

EMERGING TRENDS

The Karachi Fishermen Cooperative Society can play a vital role in leading advocacy efforts. Recently, the Pakistan Fisherfolk Forum and Sindh *Taraqi Pasand Mallah Tanzeem* have been formed to mobilize communities and network with other groups for protecting and promoting fisherfolk livelihoods. These organisations, whose membership has ballooned to include several thousand, have initiated a campaign against industrial fishing.



Muhammad Anees Shahzad

A biodiverse specimen: the Gintar Fish

A number of resource management programmes and initiatives are taking place in Sindh to promote the ecological well being and socio-economic uplift of the coastal areas. The agencies involved in these programmes include the NIO; SUPARCO; Centre of Excellence in Marine Biology, University of Karachi; the IUCN Pakistan and WWF Pakistan. However, the lack of coordination between these organizations and an absence of an integrated vision are major constraints to these efforts.

STAKEHOLDERS

Policy Makers

The Ministry of Environment and Urban Affairs is a relevant umbrella policy-making body. It is the focal institution working in the field of environmental protection in Pakistan and has an overall responsibility in all environmental matters.

Regulatory Agencies

The implementation and regulation of the Environmental Protection Act is the



Muhammad Anees Shehzad

Turtle enclosure at Sandspit

responsibility of the Environmental Protection Agency, Sindh, whereas the Pakistan Maritime Security Agency, established in 1986 by the Government of Pakistan, oversees Pakistan's interests in the maritime zones and the EEZ. In addition, the Director General, Ports and Shipping, Federal Ministry of Communications, is responsible for regulating all port and shipping related matters.

Administrative Bodies

The Karachi Port Trust is responsible for the management, administration and development of all port-related activities at the Karachi Port. Similarly, the Port Muhammad Bin Qasim Authority is responsible for the management, administration and development of all port related-activities at Port Qasim.

The Sindh Coastal Development Authority has the overall mandate to coordinate and manage the coastal areas of Pakistan and the Karachi and Korangi Fish Harbour Authorities in Sindh, in cooperation with the Sindh Fishermen Cooperative Societies that manage fishing-related activities along the coast.

Resource Management Organisations

Regulation and the supervision of the artisanal and mechanised fishing activities along the coast are carried out by the federal and provincial fisheries departments, in co-ordination with the Fish Harbour Authorities. Close collaboration with the federal and provincial forestry and wildlife departments is essential, as they are responsible for administering and managing the forestry sector in Pakistan.

FUTURE ACTION

Efforts to control the marine pollution in the territorial waters of Sindh can be bolstered through the enforcement of the Sindh Fisheries Ordinance 1980 with necessary amendments to cover agricultural effluents.

Provincial laws relating to over-fishing in territorial waters are quite comprehensive. As a minimum measure, these regulations need to be seriously enforced including the imposition

of severe penalties. The seasonal ban on fishing can only become effective when applied to all commercial fishing crafts without any concessions or exceptions. The use of fine meshed nets and foreign trawling also needs to be checked and regulated.

To counter environmental threats such as inland salt water intrusion and salinisation of agricultural land, the relationship of the Indus discharge with the Sindh coast mangrove forests and coastal and deep sea fisheries needs to be evaluated, along with their economic and social implications. This would justify the water discharge required for the delta. This is all the more important since many new irrigation schemes are being proposed for the upper reaches of the Indus basin which will lower the discharge levels downstream.

Through the Exclusive Fishery Zone (Regulation of Fishing) Rules 1990 and the Territorial Waters and Maritime Zones Act 1976, the federal government can take steps to prevent pollution in the deep sea. However, provincial efforts for conservation and protection of fishing communities are likely to be far more effective when federal actions complement provincial regulations.

Establishing a separate coastal zone authority for Karachi should be considered, acknowledging its economic importance, ecological status, and the complexity of issues. The establishment of elected local governments in the country (under the recently implemented devolution of power process), with greater powers and functions than ever before, could facilitate the effective planning and

implementation of Improved Coastal Zone Management (ICZM) strategies and actions.

The preparation of an updated data bank of the physical, climatic, hydrologic and ecological features and processes of the Pakistan coast is essential if realistic planning and institutional development is to be carried out. For this, financial resources will have to be committed. This process could be undertaken in coordination with a number of global networks and organizations involved in such activities. Organizations such as National Institute of Oceanography (NIO), SUPARCO, Maritime Security Agency (MSA) and academic bodies such as the University of Karachi, NED University of Engineering and Technology, Karachi, can play an effective role in this process.

The fisheries sector is economically the most significant actor along the coast as it employs a majority of the local inhabitants. However, its impact and potential could be significantly enhanced if the fishing community is financially empowered and its technical and operational capacities and capabilities are improved. This requires investment in the indigenous development of fishing technology and meeting infrastructure needs such as a network of jetties and cold storage facilities at important landing sites. These, in turn, have to be linked with market centres.

For greater involvement of the public in coastal related issues and to make an impact at the grassroots level, it would be desirable if local councillors, particularly women, are provided opportunities for obtaining training in coastal resource management.



CHAPTER 12

Flora



Sindh is endowed with a rich diversity of flora. This flora, apart from its aesthetic value, is used as fodder, in rural homes, in industry as well as in the production of medicines.

Pakistan is among the leading exporters of medicinal plants in the world with an estimated annual export worth of ten million USD. Various species of medicinal plants are found in Sindh including *Ziziphus nummularia* found in the Salt Range, *Opuntia ficus - indica* found in Tharparkar and the *Prosopis cineraria* which are common in Thal, Cholistan and Tharparkar. These plants are used in health care products, in traditional medicine (either as raw, single herb preparations or as manufactured finished products, including substances of psychotropic and ritual/religious value) as well as raw material for the pharmaceutical industry. The local population uses them as culinary additions, spices and colourings as well as in natural cosmetics and perfumes.

Like other developing countries, Pakistan is experiencing depletion of its flora resource base at an increasingly high rate. This is because of a rise in the population, its poverty and the exploitation of natural resources. For example, mangrove forests are being diminished due to the decreasing supply of freshwater from the Indus and by the deforestation activities of poor communities who have no other affordable energy options. Similarly, *Commiphora whightii* in Tharparkar is being adversely affected by drought.

Although Sindh is for the most part arid or semi-



Badar Abro

The Cactus plant is common in the arid lands of Sindh

arid, there is definite geological and archaeological evidence of a fairly humid climate in the past¹. The Indus civilization was the abode of marsh-loving animals. Evidence suggests that until 500 BC, Sindh was well wooded, with subtropical forests that were

Box 12.1: The *Neem* Tree, an important medicinal plant

Azadirachta indica or '*neem*' is a fast-growing plant reaching up to a height of 15-20 m. It is an evergreen tree, but it sheds most or nearly all of its leaves, when dry conditions persist for long. It is a shady tree giving off white flowers that have a honey-like smell. In the Sub-continent, there are about one-crore 80 lakh neem trees. They are usually planted on the roadsides or near the bazaars to help in the protection against the sun.

Neem can grow in any warm and dry place; it gives best results where rainfall exceeds to more than 400-1200 mm yearly. It grows well in certain acidic soils but does not survive in the waterlogged and saline soils. The leaves of the tree are beneficial and used as a natural remedy for certain diseases. Its seeds and the leaves help to kill bacteria, fungi and certain harmful pests and insects. Due to the pollution in our environment, various lethal diseases have become common. The *neem* tree is now gaining importance as the advantages are making people realise its importance. *Neem* is known to cure certain diseases like malaria and it helps to get rid of stomach worms.

Since time immemorial, people have used the *neem* tree for different purposes. Research has proved that the various compounds of the tree are good for medicinal purposes. *Neem* also helps to control the ferocity of floods and maintain the fertility of land. It has been used as a natural antibiotic to help combat various diseases in animals as well as human beings.

Source: IUCN Pakistan

1. Khan, F.K., 1991. A Geography of Pakistan, Environment, People and Economy, Oxford University Press, Karachi, Lahore, Islamabad



A Neem Tree

inhabited by many animals including elephants and wild buffalos.

Available information about the ecological distribution of vegetation in Sindh is scanty, outdated and therefore, unreliable. The literature that is available makes a comparative study difficult as it does not cover the defined geography of Sindh. The scientific accuracy of data in many cases is also questionable.

There are only a few studies that help in the delineation of the ecological zones of the country in general, and of Sindh in particular². A careful scanning of fascicles reveals that almost 114, out of a total of 209 families, constitute the flora of Sindh. These consist of 944 species. To have a better understanding of the flora of Sindh, it can be divided into the following major habitat types:

ECOLOGICAL ZONES

Refer to map 12.1 for details on ecological zones in Sindh.

Littoral and mangrove: This zone possesses mangroves that are fairly widespread. In Sindh, these forests are confined to a few areas and represent a genetic stock adapted to local conditions. These areas serve as a dwelling for plant and animal species vital for biodiversity in this ecosystem.

Plant species in these regions are *Avicennia alba* (= *A. officinalis*), *Ceriops tagal* (*C. candolleana*), *Halopyrum mucronatum* and *Bruguiera conjugata*. In most regions there is a pure stand of only *Avicennia*. In higher areas, not subject to daily inundation, there is a low scrub of *Salsola imbricata* and *Suaeda fruticosa* with scattered bunches of grasses such as

2. Hooker, 1904; Stewart, R.R. 1972. An Annotated Catalogue of the Vascular Plants of West Pakistan and Kashmir, Fakhri Printing Press, Karachi; Iqbal, S.H. & Sheikh, M.I. 1987. Vegetation of Mountain Regions of Pakistan, Resource Potential of Mountain Region of Pakistan (Shams, F.A & Khan, K. eds.), Centre for Integrated Mountain Research, Punjab University, Lahore; Ali, S.I. and Qaiser, M. 1986. A Phytogeographical Analysis of the Phanerogams of Pakistan and Kashmir, Proc. Roy. Soc. Edinb. 89:89-101; Bano, F., Malik, S., Shah, M. & Nakaike, T. 1995. A Note on Topography, Climate, Geology and Ecology of Pakistan Cryptogams of Himalayas. Vol.3. Nepal and Pakistan (Watanabe, M. & Hagiwara, H. eds.), National Science Museum, Tsukuba, Japan

Urochondra setulosa (= *Heleocholea dura*) and *Halopyrum mucronatum*. For more details see Table 1 in **Appendix 12.1: Flora of Sindh in its Major Habitats**.

Riverine: This zone comprises of habitats located in the immediate vicinity of the Indus River and its tributaries up to the base of the foothills in the north. Due to the control of seasonal flooding through irrigation barrages and increased intensity of cultivation adjacent to the main riverbanks, this zone is rapidly disappearing and the riverine forests are drying out.

Plant species in these regions are *Climax Acacia nilotica* (= *A. arabica*), and in less stable areas, *Tamarix indica*, *Tamarix aphylla*, *Populus euphratica* with grasses such as *Saccharum ben galense* (= *Erianthus munja*, *Saccharum munja*) and *Saccharum spontaneum*.

Swamps and the jheel: These areas are subject to summer flooding and often become dry by April or May. Typical examples are found around the East Nara and Sanghar, Ghauspur (Jacobabad district) and Manchar (Dadu district).

The most commonly found plant species in these regions are *Taniarix dioica*. Other dominant shrubs and grasses are *Phragmites karka*, *Typha angustata*, *Paspalum paspaloides* (= *P. distichum*), *Imperata cylindrica*, *Arundo donax*, *Sacdaruni spontaneum*, and in water pools *Valhsneria spiralis*, *Neiunbium nuciferum* and *Hydrilla verticillata* are present. For more details, see Table 2 in Appendix 12.1.

Tropical thorn forest: This is a major habitat originally occupying the entire Indus plain from the foothills to the coast, but due to human activity over the course of more than one thousand years, most of this forest has been lost. Its principal edaphic feature is deep soil, where the tropical thorn forests survive in small pockets. A few have recently regenerated in areas such as airfield peripheries (for soil stabilization), around graveyards, and uncultivated areas such as saline flats or the *patt*. In Sindh, they are mostly found on the right bank of the Indus around Kashmore.

Plant species in these forests are *Prosopis cineraria* (= *P. spicigera*), *Capparis decidua*, *Salvadora oleoides*, *Tamarix aphylla*, *Ziziphus nummularia*, *Calotropis procera*, *Suaeda fruticosa* with grasses such as *Aristida adscensionis* and *Octhocloa compressa* (= *Eleusine compressa*). Some of these species are scattered shrubby trees which are affected by lopping. In the waterlogged and saline areas of the south, *Salvadora oleoides* is replaced by *Salvadora persica* and *Tamarix indica* and in the southwest the calcareous rocks are dominated by *Euphorbia caducifolia*.

Sand dune desert: There are five main sand dune deserts in Sindh. They are widely separated from each other. One of these is located between 610 and 1,060 meters (2,000 and 3,500 feet) above sea level. The others are less than 152 metres (500 feet) above sea level. Thar is a typical example of the latter type.

Plant species in these deserts are *Prosopis cineraria* (= *P. spicigera*), *Tamarix aphylla*, *Euphorbia caducifolia*, *Capparis decidua*, *Salvadora oleoides*, *Commiphora wightii* (= *C. mukul*), *Ziziphus nummularia*, *Grewia tenax*, *Cassia senna* (= *C. angustifolia*), *Calligonum polygonoides* and *Blepharis sindica*. For more details, see Table 3 in Appendix 12.1.



Date trees provide fruit and fodder

IUCN Pakistan

Dry, sub-tropical, semi-evergreen scrub forest: These are tracts with ridges of sandstone and limestone escarpments, interspersed with low soil deposits in the northern regions of the province. Generally, they are heavily overgrazed by domestic stock and pocked by severe gully erosion. They are found in the hilly areas of Kohistan at an elevation of 3,000 feet and above.

Clumps of cactus-like *Euphorbia* dominate the landscape of Kohistan, which is subject to humid winds during the monsoon season but is hot, dry, and relatively frost-free for the rest of the year. Other species in the region are *Acacia jacquemontii*, *Maerua crassifolia*, *Commiphora wightii* = *C. mukul*, *Ziziphus nummu/aria*, *Rhazya stricta*, *Euphorbia caducifolia*, *Grewia tenax*, and *Blepharis sindica*. For more details, see Table 4 in Appendix 12.1.

CONSERVATION ISSUES

Conservation of flora resources is a low priority although Article 7 of the CBD acknowledges the importance of flora by identifying them as one of the components of biodiversity. Although efforts are made to conserve wildlife, plants are almost always excluded from this. There is a Society for the Protection of Flora but it has not been very effective. Interaction between the stakeholders and interest groups, especially between researchers and the NGOs active in this field, has been weak. This has resulted in uncoordinated and ineffectual campaigns that have not been able to muster support or generate enthusiasm from the communities and groups who could have benefited from them.

Maintenance of organized data is essential for the future monitoring of the sector. However, there is no institution specifically designated to maintaining and storing data on biodiversity for analysis and dissemination. The National Herbarium, the Pakistan Museum of Natural History, and the Karachi University Herbarium maintain some data on the flora, and additional information is available in universities and provincial forest departments but, unfortunately, the data collection and research at these institutions is not coordinated.



Badar Abro

Water Lilies are an important aquatic plant found in wetlands

Natural catastrophes, overgrazing, and improper exploitation of resources are some of the major causes identified in the reduction of green areas. Furthermore, the construction of Sukkur Barrage in 1932 turned scrub forest into paddy land but also increased waterlogging in Sindh, which led to the destruction of much of the flora in its command area³.

Although legislation like the Forest Act, NEQS and the Wildlife Protection Act exist, they are not enforced. Political interests, feudal influence and involvement hamper the implementation of these legislations. In addition, the administrative set-up is run on an ad-hoc basis with a limited budget and often without any long-term planning. As a result, few trained people remain employed in these institutions.

EMERGING TRENDS

There is a growing awareness among various stakeholders that this sector needs closer attention. The National Herbarium, a federal institution, is engaged in data collection on the

3. Hasnain, S.Z. and Rahman, O. 1957. Plants of Karachi and Sindh. Monograph No.1. Department of Botany, University of Karachi. Karachi

floral diversity of Pakistan with over 100,000 plant specimens stored with primary field data. It has prepared the first account of the Flora of Pakistan, which acts as a baseline document for plant diversity of the country. The Herbarium has initiated the preparation of databases to facilitate scientists in the country and information exchanges with other regional institutions. A database to prioritize medicinal plants for conservation is near completion. This information will be useful in assessing the market demand and conservation status of rare plants. It will also assist in the formulation of necessary steps for the cultivation of threatened species to ensure sustainable supply to markets and in determining research priorities. However, the flora of Sindh continues to be threatened due to droughts, water shortages, desertification because of the over-exploitation of and stocking of rangelands, and badly conceived drainage and irrigation projects such as the LBOD, RBOD and the Chotiari reservoir.

A number of projects of the WWF-Pakistan and the IUCN involve communities in preserving the flora in their regions and managing it on a sustainable basis. However, such projects are too few to make a substantial difference unless they can be replicated effectively.

STAKEHOLDERS

The Local Population

A majority of the local population is disinterested in the preservation of flora when it conflicts with their short-term economic needs. For the most part, they are not organized communities and have difficulty in receiving and translating information into workable development models.

Interest Groups

These include the *hakim* (traditional healers), herb collectors, NGOs and botanists. The scant number of these people restricts their ability to act as key stakeholders. Also, they are fragmented and do not have a platform for collective action. They are not linked in any way

to government and academic research institutions. Consequently, they cannot promote or effect policy decisions and their implementation.

The Government

The Government of Pakistan is party to some international agreements that compel it to play a role at national and regional levels. However, various government institutions that deal with flora related issues need to coordinate their efforts.

World Wide Fund for Nature-Pakistan (WWF)

WWF-Pakistan has been a consistent stakeholder in this sector. It networks with other partner organizations along with local communities in its work. For example, the Mangrove Conservation Project (1997-2002), at Sandspit in Karachi, laid special emphasis on the capacity building of the local community and promoted its active involvement in mangrove plantation and its sustainable management. A nursery has been established at Sandspit for demonstration and awareness-raising activities. Around 700 ha of mangroves are earmarked for sustainable management in partnership with local communities.

At present, the WWF-Pakistan is working on a project titled 'Tackling Poverty in Pakistan's Coastal Communities through Sustainable Livelihood Project' which is being implemented from March 2003 with support from the European Commission. The project aims at improving the sustainable livelihood of people living in four coastal communities, two of which (Keti Bunder and Sandspit) are located in Sindh.

FUTURE ACTION

As a first step, strengthening of institutions is required in order to expand and improve the information base through various research projects. This will lead to the development and institutionalization of systems to monitor the components of biodiversity.

Since the publication of the first issue of the Flora of (West) Pakistan in 1970, about 32 years ago, new data has been added and fresh material is now available for study. Hence, it is imperative to update the publication and disseminate it widely.

It is necessary under Article 7 of CBD, to prepare authentic and reliable inventories of endangered and threatened plant species so that effective steps may be taken under other articles of the Convention. It is imperative that

the capacity building of the implementing agencies is undertaken by tapping indigenous resources.

Documenting information of successful government and NGO interventions that record and preserve flora should be a first step towards the replication of these interventions. Following this, strong lobbying should be undertaken to approach the federal and provincial governments and donor agencies to fund similar activities.



CHAPTER 13

Wildlife



Historically, the province of Sindh was known for its diverse range of habitats, ecosystems and several unique species of wildlife. However, the present state of almost all wildlife species in this region is bleak. Immediate action needs to be taken to address this predicament although it may already be too late for some species that have already become extinct.

BIRDS OF SINDH

Birds from the South Asian subcontinent, East Africa, Europe and much of Asia are found in the Sindh, which serves as a caravanserai for Eurasian avifauna travellers. Some fly in to stay for the winter, while the rest fly through. For many species the province serves as a breeding ground while others procreate in other areas but have been spotted in this region. There are resident species specific to Sindh, whilst others come from far and wide.

The Wilson's Storm Petrel which may be sighted off the coast of Karachi breeds on the continent of Antarctica. The Lesser Golden Plover, seen around Karachi is known to breed only in the Kamachatka Peninsula lying nearly a thousand miles north of Japan¹. The flocks of the Blue Cheeked Bee-eater spend their winter over a wide range of countries in East Africa. They cross the Arabian Sea to arrive in Karachi and the Makran Coast from the end of April to May.

Sindh has four resident species of ducks of which three are tree ducks like the Lesser



Muhammad Anees Shehzad

Northern Eagle Owl or Great Horned Owl is found in Sindh



Muhammad Anees Shehzad

Barn Owl or Hewt Owl (Tyto Abba) is found in Sindh

whistling teal, Cotton teal and Marbled teal; while the Spotbill duck is a marsh duck. The numbers of both diving, as well as surface feeding ducks, have declined. Marbled teal breeds on salty open marshes on both sides of Nara canal and on lagoons located on left bank of Rohri canal in Nawabshah district. Although, all four species are declared "protected" species under the Sindh Wildlife Protection Act, 1993, they continue to be hunted. The remodelling of Nara canal, excavation of a seepage drain on its right bank and the construction of Chotiari reservoir in district Sanghar of Sindh are likely to transform the landscape and the environment of the entire area. The existing wetlands of Chuch and Wasoo located on the right bank of Nara canal in Nawabshah district which are breeding grounds of Marbled teal and Lesser whistling teal, would then disappear altogether. Those on the left bank of Nara canal are going to be submerged under a huge column of water from the Chotiari reservoir. The loss of habitat and illegal trapping activities are perhaps the greatest threat to most game birds.

1. Roberts, T. J., 1991-1992, *The Birds of Pakistan*. Oxford University Press

Among the Order Galliformes, the grey and black partridge are considered the most favoured game birds by sportsmen due to the succulent quality of their white meat, which is considered a delicacy. Both species were once of very common occurrence but in recent times their numbers have declined considerably and, at some places, the birds have been completely exterminated. There are several factors that account for this, particularly illegal trapping and the loss of habitat. The Black partridges were found in agricultural areas particularly close to sugarcane fields. The increased use of pesticides adversely affects this species since they feed on poisoned worms. This causes chemicals to accumulate in their body fat reserves or reproductive systems causing infertility or impotence. The carcinogenic compounds in pesticides also cause thinning of the egg shells that break before hatching.

The Indian peafowl, also from the Order Galliformes, was once common in the desolate and undisturbed areas of the south-eastern corner of Sindh. Their numbers are, however, dwindling. In the 1940s they were quite abundant in many areas in Sindh with sufficient water supplies, such as the Sanghar and Mirpurkhas districts. But after independence hunters and trappers diminished their population greatly; unlike the predominantly Hindu community of Tharparkar, they did not regard these birds as sacred. Today there are a larger number of birds in the extreme southern border regions where the Hindu community still protects them. However this species cannot escape the nexus formed between the officials and trappers in Thar.

Bird watchers have narrated seeing hundreds of Grey Lag geese found grazing on tender wheat tufts along the Manchar banks near Shah Hasan. A whole flock was reported whirling over the Indus near Jamshoro in 1978. Another small flock of Grey Lag was seen and filmed on Hudero Lake in 1992 and teams on Hamal Lake in Larkana district have recorded regular sightings during mid-winter waterfowl counts. Over the years, there has been a decline in the number of species that is attributed to the loss of habitat coupled with changes in temperature with Sindh now experiencing less severe winters.



Muhammad Anees Shehzad

Western Reef Heron at Manchar Lake

The first sighting of the Sirius crane, a localized species of Rajasthan, was reported in 1978 when three birds were seen nesting on a large pond at Sangah Talhah near Virawah, Nagarparkar². The current status of the species in Sindh is that of an endangered one. The other two species of cranes (the Common crane and the Damoiselle crane), migrate in large numbers from the Palaearctic region, pass over Balochistan, and enter Sindh during early October, using the Hub Dam and the Indus open flood plains in Kacho areas as a stopover. These birds migrate further south towards the Great Runn where they spend their winters and safely return to their nesting grounds in the month of March. The status of these two species is still safe and static.

The Eurasian Black Vulture or the Cinerous vulture can also be found in Sindh. They breed in Balochistan and NWFP but migrate to Sindh during winters. In the 1950s sizable groups of Cinerous vultures could be seen on the outskirts of Karachi at refuse dumps. They have also been sighted at the Khadeji Falls, 20 km from Karachi, which is a favourite winter roosting ground. The waterfall is losing its appeal for

2. Ali, Khursheed. Reappearance of the Sirius Cranes in Pakistan

migratory birds as it is drying up because of low water level in the drain that brings water up the fall³. There are several other factors that affect the population of this species in Sindh. Since there is an increased demand by European and American zoos to display these rather magnificent birds, they are being transported to artificially created habitats. A recent epidemic of an unknown infectious disease that affected these vultures has contributed to their decline.

Family Otididae was once well represented by its members especially the Houbara bustard (taloor). This is not a resident species however large populations would spend their winters in the borderline-desert areas of Cholistan and Thar. The movement of these birds is increasingly dependent on the availability of food, as well as seclusion and freedom from disturbances. The local hunters and Arab falconers have ruthlessly hunted this shy and wary bird. No attempts have been made to conduct regular counts at the completion of migration or precise bag counts that can be obtained from the falconers at the end of the

hunting season. However, the migratory pattern shows considerable decrease. Prior to the arrival of foreigners that are invited to the region purely for hunting expeditions this species was abundant enough for the birds to be spotted in throngs rather than as solitary.

The status of the Great Indian bustard (goramo) is also endangered in Sindh. This species, once a resident of Nagarparkar and arid areas of Sindh adapts to semi-desert and grass-steppe conditions. In the 1970s small numbers were sighted in border desert regions in Cholistan and in the Thar desert⁴. It is now a vagrant due to disturbance by local and foreign poachers.

Family Rostratulidae is represented by three species of snipes, two species of Godwits and the Eurasian curlew. However, the numbers of Jack snipe, Common snipe and Pintail is decreasing due to disappearance of its habitat which is mostly estuaries and mudflats in lower Sindh.

Family Pteroclididae (Order Pteroclidiformes) is well represented by its members in Sindh. All



Muhammad Anees Shehzad

The vibrant male peacock

3. Khan, Z. A. 2000. Khadeji Falls Dryingup, losing Attraction. Dawn <http://www.dawn.com/2000/04/16/nat16.htm>
4. Roberts, T. J. 1991. The Birds of Pakistan, Vol. 1. Oxford University Press, Karachi



Saker Falcon (Falconcherry) is found in desert and hilly areas

but Pallas or Imperial sandgrouse are resident species. Among the sandgrouse the Spotted and Chestnut bellied sandgrouse outnumber other species and are fairly evenly distributed all over the arid areas of Sindh. Both species were breeding effortlessly but their numbers have decreased considerably due partly to the severe and continuous drought that has resulted in the disappearance of water-holes (toba and small water-ponds), and because of indiscriminate hunting.

Family Columbidae (Order Columbiformes) is represented by five species, of which the most common are the Indian Ring dove (or Collared dove) and Little Brown dove (or Laughing dove). Their numbers are decreasing sharply due to feeding on wheat grains treated with organo-phosphorous compounds.

From the Falconidae Family, the Laggar falcon is a resident species of the less cultivated areas in the province. It is found throughout lower Sindh, especially along canal banks with tree lined embankments in Badin district and the drier parts of Dadu district, inhabiting scrub desert areas, low hills or gullies. It has been noted that this species was able to adapt to

the urban environment, nesting in areas in Karachi up to the late 1940s however the condition of modern day Karachi inhibit this pattern of behaviour and none have been spotted within urban areas for the past few decades.

Other species belonging to the Falconidae Family found in Sindh are Merlin, Northern hobby, Saker falcon and Peregrine falcon all of whom are visitors from the Palaearctic region. The Northern hobby is a summer breeding visitor to the northern mountain regions of the country; however it has been spotted in hilly areas near Karachi and in Thatta. The Merlin is a winter visitor and has been sighted in Dhabeji and Mirpur Sakro in Thatta district of Sindh. Being a migrant species, single birds are usually spotted as opposed to resident species that are found in pairs or clusters.

The Saker falcon, which is found in drier hilly areas of Sindh, is becoming increasingly rare. The Saker falcon can be trained to hunt houbara and gazelle and hence is sought after by Arab Falconers. This has undoubtedly led to their rapid disappearance from the region as a female in good plumage would fetch as much

Muhammad Anees Shehzad



Flamingos, an important migratory bird found in Sindh

as US\$ 50,000 in 1983⁵. The Peregrine falcon suffers the same fate. This species could fetch up to US\$ 60,000 in the mid-eighties. At present, owing to its scarcity and inflation, its value has increased considerably. The Peregrine falcon is a winter visitor, mostly restricted to the coastal marshes, lakes, and the dhand in lower Sindh. Occasional individuals can be encountered along the mangrove creeks and Karachi seacoast.

There are various species of raptors abundant in Sindh but only a few are associated with the hunting of game animals. The Goshawk is a rare migrant visitor to Sindh, favouring wooded areas. It is associated with the sport of falconry particularly by landowners, who train them to hunt hares and Grey partridges.

Among the resident species are White Eyed buzzard, Shikra, Red-headed merlin and Kestrel. The White Eyed buzzard is the most widespread raptor in the province since it is well adapted to irrigated cultivation and wooded areas as it is to fairly treeless scrub desert

areas. The Shikra is quite common throughout the Indus plains. It is more partial to irrigated forest areas than desert facies. The Red Headed merlin is a resident species and believed to be largely sedentary. Occasional birds can be spotted in the desert border regions of Tharparker and Cholistan, outside Karachi in Malir. It is probably rarer in other parts of Pakistan. Like all other species of falcons in the region, with the single exception of Kestrel, the Merlin population has declined considerably due in some measure at least to the falcon trade⁶. These raptors are used as decoys for capturing Sakar and Peregrine falcons from the Thar desert and the Kohistan tract. Since these birds feed on field mice, snakes and other reptiles, the population of some pests has increased. The imbalance in biodiversity is a vicious cycle as the increase in pests affects agricultural production, human consumption and the livelihoods of the farmers.

Trappers and hunters have victimised the common quail which migrates to this area during September from southern Punjab and

5. Ibid
6. Ibid

Table 13.1: Important Birds of Sindh

S.No.	English Name	Scientific Name	Local Name
1	Great Bustard	<i>Ardeotis nigricps</i>	Barri Tiloor, Hukna
2	Houbara/Macqueen's Bustard	<i>Chlamydotis macqueeni</i>	Tiloor, Houbara
3	Common/ Blue Peafowl	<i>Paro cristatus</i>	Neela More, Mor
4	Black Francolin/ Partridge	<i>Francolinus francolinus</i>	Kala Titer, Karo Tittar
5	Grey Francolin/ Partridge	<i>Francolinus pondicerianus</i>	Bhura Titer, Achho Tittar
6	Yellow Legged Green Pigeon	<i>Treron phocnicoptera</i>	Harrial Kabutar
7	Red Turtle Dove	<i>Streptopclia tranquebarica</i>	Surkh Fakhta
8	Dalmatian Pelican	<i>Pelecanus crispus</i>	Hawasal, Pains Pakhhi
9	Lesser Flamingo	<i>Phoenicopteru minor</i>	Lum Dheeng/ Laakho Jani
10	Oriental Darter/ Anhinga/ Snake Bird	<i>Anhinga melanogaster</i>	Jall Kawwa
11	White Stork	<i>Ciconia ciconia</i>	Safaid Laqlaq/ Achhhi Toor
12	Painted Stork	<i>Mycteria leucocephala</i>	Rangeen Laqlaq, Chit rod toor
13	Greater Painted Snipe	<i>Rostratula benghalensis</i>	Rangeen Isnif
14	Sociable Lapwing	<i>Vanellus gregarius</i>	Tattihri, Sehkari teeto
15	Pheasant tailed Jacana	<i>Hydrophasianus</i>	Peehoo, Peehoori
16	Spot Billed Duck	<i>Anas poecilorhyncha</i>	Hanjar Batak, Khanjar
17	Marbled Teal	<i>Marmaronetta angustirostris</i>	Mar Marin Batak
18	Mallard	<i>Anas platyrhynchos</i>	Neel Sar, Neergi
19	Brahminy/ Ruddy Shelduck	<i>Tadorna ferruginea</i>	Surkhab, Lallo Hanj
20	Brown Headed Gull	<i>Larus brunaicephalus</i>	Bhori Sar Kina
21	Caspian Tern	<i>Sterna caspia</i>	Caspian Dhumrah, Kekrah
22	Indian Skimmer/ Scissors-Bill	<i>Rynchops albilcullis</i>	Qainchi Chouch/Pann Cheer
23	Sarus Crane	<i>Grus antigone</i>	Sarus Koonj
24	Imperial Eagle	<i>Aquila heliaca</i>	Shahi Oqab
25	Pallas's Fish Eagle	<i>Haliaeetus leucorhyplus</i>	Palasi Oqab, Machh manga
26	Peregrine Falcon	<i>Falco peregrinus</i>	Behri/Kala Shaheen
27	Saker Falcon	<i>Falco cherrug</i>	Charagh/Saker Baaz
28	Eurasian Eagle Owl/Great- Horned Owl	<i>Bubo bubo</i>	Oqabi Ullu
29	Lesser Golden-backed Woodpecker	<i>Dinopium benghalense</i>	Sunheri Khatkhat
30	Sindh Pied Woodpecker	<i>Picoides assimilis</i>	Sindhi Khatkhat
31	Blue Cheeked Bee Eater	<i>Merops persicus</i>	Barra Mugs khor/Traklo
32	Golden Oriole	<i>Oriolus oriolus</i>	Sunheri Peelak, Peelkio
33	Indian Treepie/ Rufous Treepie	<i>Dendrocitta vagabunda</i>	Nabatati Zagh/Katar Khaan
34	Common/ Punjab Raven/ Desert Raven	<i>Corvus corax subcorax</i>	Doodh kaag/Paharri Kawwa
35	Pied Crested/Jacobin Cuckoo	<i>Clamator jacobinus</i>	Choti Dar Koel/Tarro
36	Rosy Starling/ Rosy Pastor	<i>Sturnus roseus</i>	Tillear, Gulabi Myna
37	Jordan's Babbler	<i>Chrysomma altirostre</i>	Jorden Ki Ghoghai, Doomni, Pinjhrro
38	Sindh Jungle Sparrow	<i>Passer pyrrhonotus</i>	Sindhi Gorria, Jungli Chirria
39	Red Avadavat/ Red Munia	<i>Amandara formosa</i>	Surkh Piddi, Garrho Cheeho
40	Baya Weaver	<i>Ploceus philippinus</i>	Baya, Borri.

Source: Sindh Wildlife Department



Pair of common Cranes

Rajasthan. These birds are lured by trappers through recorded sounds when they migrate from Sindh to the Makran coast and onwards to neighbouring Oman.

See-see partridges are also trapped and sold openly in the bird market near Empress Market, Karachi. The status of See-see partridge and Chukar or Blue Rock partridge has not been disturbed and the birds are localized to Kirthar range and the foothills of the Kohistan tract.

IMPORTANT MAMMALS OF SINDH

Family Cervidae is the only widely represented family in Sindh. Until today, the hog deer has withstood hunting pressure though it has been brutally persecuted ever since the early twentieth century. Their numbers dwindled sharply after Makhi dhand was deforested and inhabited by the British Government in 1942. Uncontrolled hunting in the Nara canal area and in the adjacent prosopis forests has almost exterminated its population from this once rich habitat. It has survived well in riverine forests

and a few have been well-preserved in the Keti-Jatoi riverine tract by a wildlife enthusiast, Mujtaba Khan Jatoi, and also by Mir Ali Murad Khan Talpur in his privately owned Mahrano game reserve near Kot-Diji, Khairpur. The Sindh Wildlife Department has also initiated a successful captive breeding programme of hog deer at lagoons and swamps near Haleji Lake by creating an ideal but artificial environment. There has been no inundation of riverine forests since 1994 and wild populations of hog deer are at risk both from hunters and because of environmental stress.

The common gazelle, one of the most beautiful and highly adaptive animals of Sindh with its large protruding black eyes, was once found in the arid, gravelly plains of Kirthar, Lakhi, west of Ghaibi-dero and Nasirabad up to an elevation of 3,000 feet towards the highest peak in Sindh (Kuti-ji-Qabar). The animal has literally been exterminated from Jungshahi, Jhimpir, Ghaibidero, and Kotri to Amri. Only a few animals now survive in the remote and rugged ravines of the Kirthar National Park, Mahal Kohistan Wildlife Sanctuary, Hub Dam Wildlife Sanctuary, Bahnir range near Sari in Kohistan, Achro Thar in Sanghar, Jumo Samoo and



A male and female Hog Deer at Mehrano

border areas of Chachro, Nagarparkar and Winhi in Diplo taluka. Unfortunately, night safari hunting is exterminating this species. This illegal hunting increases during the early monsoon showers when the animals come out to graze on tender grass shoots. Another cause of their declining numbers is attributed to heavy poaching whereby young fawns are collected and sold in Karachi from where these are smuggled to the Gulf States concealed in the holds of fishing trawlers. Prior to the introduction of jeeps, which are now used for night safari hunting, large herds of gazelles were stalked by hunters on camels.

Rojh, the Blue bull common in bordering India, is restricted to a small area called Asalri near Nagarparkar, and has a natural refuge in *Prosopis glandulosa* (Devi) thickets. Under a re-introduction programme, 12 black bucks were imported from a ranch in Texas in 1974 under the IUCN species survival programme and released at Khar breeding centre in Kirthar National Park. The Black buck herd bred profusely and some 12 pairs were given to Mir Ali Murad Khan Talpur for breeding at the Mehrano captive breeding centre. At present, there are more than 450 animals at Mehrano.

Another small herd was given to Ghulam Mujtaba Jatoti for breeding at his game reserve in Kandiaro where the herd population has grown to more than 45.

The Sindh urial or Wild sheep (gad) and the Sindh ibex or Wild goat (sarah) were found in large numbers in the Kirthar range, Pub range, Lakhari range and in off-shoots of the Kirthar range in Mari, Mongthar and Lushar in the vicinity of Moidan. They were also found in Lakhari range, west of Johi, extending from Shah Godro to the high mountain peak near Kuti-Ji-Qabar. Their number has decreased to around 110 ibex and 13 urial. The ibex was completely wiped out from Moidan by 1968, which was subsequently declared a National Park in 1974. The area is well protected and every year the Sindh Wildlife Department conducts an annual count that shows a constant increase in the population of ibex, urial and gazelle. There are still some cases of sporadic poaching. The population in game reserves has increased considerably and regulated trophy hunting has been allowed in these areas from the year 2001. The Kirthar Reserve, which spans 308,733 acres, is said to house up to 10,695 ibex (November 2000 survey).

Hyenas inhabit rough, rocky and hilly areas and are absent from forested areas. They used to be commonly found in the Indus plain of Sindh but are now near extinction in the areas west of the Indus. They are, however, still found in sand dune laden areas east of the river, in arid tracts of the Indus plain, where human settlements are sparse, and in the Dadu and Larkana districts. They spend most of the day underground in burrows or in caves.

There has been a considerable decline in the number of Black bears which were found in Sindh. This is directly related to an increase in human population in these areas; as many of the bears are shot down to prevent them from invading croplands. A survey carried out by the WWF (1993) recorded that around 1600 bears were captured. By now the number of bear cubs in captivity has risen. The full grown mothers are usually killed during the capture and the cubs are caught by dealers and sold to nomadic gypsies, known as *Qalanders* for sums of about three thousand rupees. These men train the bears to dance and wrestle for public entertainment purposes. The same survey

(1993) revealed that 115 cubs were captured every year.

The Indus dolphin is one of the world's most specialised freshwater dolphins. It is derived from the Sea Dolphin, which is an important mammal in the coastal waters of Pakistan. Some of these dolphins migrated from the sea into the Indus River and become isolated due to the construction of barrages. Due to their habitation of the Indus River's murky waters, these dolphins developed a number of distinctive features. The Indus dolphin is confined to silt-laden flowing rivers. It avoids turbulent areas and has never been reported in the tidal waters of the Indus. This may be due to it being sensitive to salinity. Schools of different sizes have been recorded along the river at different locations but are concentrated between the Sukkur and Guddu and Taunsa, and then Taunsa and Chashma barrages⁷. The construction of irrigation barrages has divided the dolphins' population. Their movements have become restricted, as they are not able to pass through these irrigation head-works. Hence the reproduction rate has been falling as



Rafiq Ahmed Rajput

A male *Neel Gai* (Blue Bull) in the wild at Rann of Kutch, near Nagarparkar, Sindh

7. <http://indusdolphin.org.pk/about/factsheet.asp>

8. Ibid

Table 13.2: Important Mammals of Sindh

S.No.	English Name	Scientific Name	Local Name
1	Sindh Ibex / Persian Wild Goat	<i>Capra aegagrus blythi</i>	Sarah, Pahari Bakra
2	Afghan Urial / Asian Wild Sheep	<i>Ovis vignei blanfordi</i>	Gad, Pahari Dumba
3	Indian Desert Gazelle / Chinkara	<i>Gazella bennettii</i>	Chinkara, Hiran,
4	Black Buck / Indian Savana Antelope	<i>Antelope cervicapra</i>	Kala Hiran
5	Hog Deer / Parah Deer	<i>Axis porcinus</i>	Phara, Barasingha
6	Blue Bull / Nilgai	<i>Boselapsus tragocamelus</i>	Neel Gai, Rojh
7	Indian Wild Ass / Gorkhar / Onagar	<i>Equus hemionus</i>	Khur Jungli Gadha, GorkharKhuchhar
8	Striped Hyaena		Hyaena hyaena
9	Indian Desert Wolf	<i>Cains lupus pallipus</i>	Bherria, Bagharr
10	Indian Desert Fox	<i>Vulpes vulpes pusillus</i>	Lomrri, Lomarr
11	Caracal / Red Lynx	<i>Felis caracal</i>	Siah Gosh, Harola
12	Jungle Cat / Swamp Cat	<i>Felis chaus</i>	Jungli Billi
13	Fishing Cat	<i>Prionailurus viverrinus</i>	Machhi khor billi
14	Small Indian Civet	<i>Viverricula indica</i>	Mushk Billi, Rasse
15	Honey Badger / Ratel	<i>Mellivora capensis</i>	Bijju, Gor Pat
16	Scaly Anteater / Pangolin	<i>Manis crassicaudata</i>	Chiunti Khor, Chhalerano
17	Indus Blind Dolphin	<i>Platanista minor</i>	Bulhann, Susu Dolphin, Andhy Dolphin
18	Smooth Coated Otter	<i>Lutrogale perspicillata</i>	Udh Bilao, Luddharr
19	Flying Fox / Fulvous Fruit Bat	<i>Rousettus leschenaultii</i>	Urta Lomrri, Meva Khore Chimgadar,
20	Blue Whale / Sulphur Bottom Whale	<i>Balaenoptera musculus</i>	Neeli Whale, Mangrail
21	Mouse-like Hamster	<i>Calomyscus hotsoni Hamster</i>	Choocha

Source: www.sindhwildlife.com

the genetic pool has shrunk. Furthermore, they are adversely affected by excessive inbreeding, which can result in reduced fitness or physical deformities⁸. The development of irrigation systems has reduced the amount of water that flows through the rivers during the winter months. Occasionally dolphins stray into canals and irrigation systems where the water level is not deep enough. Pollutants in the river also affect the survival of these species.

Organizations such as the Indus Dolphin Project have been researching this mammal and have managed to contain the rapid extinction of this species. Strict protection

measures have also aided these efforts. The most recent surveys conducted by the Sindh Wildlife Department have recorded 602 individuals in the Dolphin Reserve (between the Guddu and Sukkur barrages) and 18 between the Sukkur and Kotri barrages. This is an encouraging increase from the 150 dolphins that were counted in the Reserve in 1974.

The Sindh bat is quite rare and locally distributed. Specimens have been collected in Southern Balochistan and northward in Sindh near Shikarpur, but no other sightings or collections have been recorded in Pakistan. It is well adapted to the climatic conditions of the

8. Ibid



Female Black Buck

desert and is therefore usually confined to warmer sub-tropical belts. There have been recordings of this species in Iran and Afghanistan as well.

The Sindh wild hare is historically found all over Sindh. Despite being a game animal and threatened by the disappearance of its habitat due to the expansion of agriculture, it has held its own because it is a prolific breeder.

The Indian wild ass or *onager* is a species of wild horse that is almost extinct. The few specimens that remain are found in the Great Rann of Kutch in the Tharparkar district of Sindh. The main predatory force for this species are humans, though wolves have attempted to carry off foals. The South-African Horse sickness (virus) and 'Surra' (caused by a blood parasite) diseases are both fatal for this species, and both of these are endemic in Sindh.

The Indian pangolin or Scaly anteater is well adapted to desert regions and prefers barren and hilly districts. Specimens have been found in a variety of locations across Sindh (on the left bank of the Indus, hilly regions of the western part of Dadu and Larkana districts, in the Hub

river valley and the Kirthar range). The pangolin is a highly specialised and adapted feeder and is therefore beneficial to man. There are enormous economic losses, both in agricultural crops and buildings, all due to damage done by termites. Unlike its African cousin, who feeds on crustaceans, anthropoids and other insects, the Indian Pangolin feeds exclusively on ants, termites and their eggs.

Mangrove Jackals have migrated to the coast from landlocked areas. They have long hair and have adapted to their new habitat by developing the capacity to eat fish.

REPTILES AND AMPHIBIANS FOUND IN SINDH

A small population of species from the Crocodylidae family. Marsh Crocodiles also known as the mugger or Broad snouted crocodiles are found about 16km north of Karachi, close to the famous shrine of the 13th century saint Kamaluddin, better known as



Crocodile at Haleji Lake

Manghopir. The number of crocodiles living at Manghopir has decreased but a large number of pilgrims and visitors still come to this place to feed them meat, believing that if the crocodiles eat their offering, their wishes will be fulfilled as myths surround their existence.

The marsh crocodile tends to be found in shallow bodies of water (both fresh and brackish). It is an adaptable creature and is able to move over land to find bodies of water if previous ones have dried up. They have been known to colonize man-made ponds known as 'tanks', as well as lakes, ponds and *jheels*. Near the salt lakes of Sindh the mugger has been known to occupy burrows on the sides of hills. The mugger is under threat mainly because it is poached to obtain the whitish yellow leather that makes up the skin on its belly. Its numbers have also decreased due to loss of habitat and poaching of its eggs.

Gharials or Gavials, also from the Crocodylidae family used to be found around the flowing rivers of the Indus river system during breeding season and otherwise preferred relatively calm waters as it enabled them to breathe with greater ease. *Gharials*

are long-lived creatures but they have now become extinct in the wild as the areas they inhabited were dammed up for both irrigation and hydroelectric purposes, preventing them from nesting on the adjoining banks. Their eggs were sought after for both food and medicinal purposes, and male *gharials* were hunted for their snouts that are said to have aphrodisiac qualities. Individuals that were accidentally caught in fishing nets were either killed by the fishermen when the nets were hauled in, or were drowned.

Indian cobras or *Naja naja naja* found in Sindh are native to Pakistan, Sri Lanka and India. They are quite adaptable to a wide range of surroundings and can be seen in wild forests, cultivated areas and rice fields. Although the Indian cobra is not an endangered species, it is hunted and killed for its distinctive skin, which is used in the production of handbags.

The Oxus cobra is quite similar in appearance to the Indian or Spectacled cobra. The Oxus cobra is extremely rare in Pakistan. It is found in the Northern Areas of Pakistan at elevations of up to 2,100m. They have also been recorded in NWFP, Balochistan and in parts of Sindh.

The Indian python is normally a jungle dweller, but occurs in open forests with rocky outcrops as well. In the absence of forests it is found in rivers and lakes. In Sindh it has been reported to exist around the Indus delta, in the Thatta and Tharparkar districts, and at Haleji Lake.

Hunting for commercial use of their skin has caused a decrease in the number of these snakes. Factors such as loss of habitat, animosity and killing for medicinal purposes have also contributed to the decline of the species over the past few decades.

Table 13.3: Important Reptiles and Amphibians of Sindh

S.No.	English Name	Scientific Name	Local Name
1	Indian Ocean Green Turtle	<i>Chelonia mydas</i>	Samundri Subz Katchhwa
2	Pacific Olive Ridley Turtle	<i>Lepidochelys olivacea</i>	Sumundri Zaituni Katchhwa
3	Spotted Pond Turtle	<i>Geoclemys hamiltoni</i>	Talabi Katchhwa
4	Indian Sawback River Turtle	<i>Kachuga tecta</i>	Daryai Katchhwa
5	Starred Tortoise	<i>Geochelone elegans</i>	Sitara Katchhwa
6	Marsh/Snub-Nosed Crocodile	<i>Crocodylus palustris</i>	Magar Muchh, Mugger, Wagu
7	Yellow / Striped Monitor - Lizard	<i>Varanus flavescens</i>	Goh, Dhari Dar Goh
8	Fat-tailed/Leopard Gecko	<i>Eubleparis macularius</i>	Hann Khann, Cheeta Chhupkali
9	Banded Dwarf Gecko	<i>Tropicolotes helenac</i>	Dhari Dar Chhoti Chhupkali
10	Sindh Broad Tailed	<i>Gecko Teratolepis fasciata</i>	Sindhi Moti Dum Chhupkali
11	Orange Tailed Sand Skink	<i>Eumeces schncideri</i>	Naranghi Dum Regmahi, Makh chatti
12	Indian Sand Swimmer	<i>Ophiomorus tridactylus</i>	Regmahi, Makh Chatti
13	Indian Spiny Tailed Lizard	<i>Uromastix hardwicki</i>	Sandha, Sandho
14	Indian Chameleon	<i>Chamaeleo zeylanicus</i>	Rung Badal Girgit
15	Indian Rock Python	<i>Molurus</i>	Azdaha, Arrarh blah
16	Russelle Sand Boa	<i>Eryx conicus</i>	Russelle ki do muhi
17	Oxus / Black Cobra	<i>Naja oxiana</i>	Kala Naag, Cobra
18	Indian Common Krait	<i>Bungarus Caeruleus</i>	Sang choor, Peeun Blah
19	Russelle's Viper	<i>Vipera russelii</i>	Ghorriala, Dumbhar Blah
20	Red Spotted Diadem Snake	<i>Sphalrocroplis arenarius</i>	Shahi Naag, Korarr
21	Pakistan Ribbon / Sand Snake	<i>Psammophis leithi</i>	Regi Samp, Shehgi
22	Glossy Bellied Racer	<i>Coluber ventromaculatus</i>	Paharri Samp, Par Blah
23	Common Rat Snake / Dhaman	<i>Ptyas mucosus</i>	Dhamman, Kua mar
24	Sindh River Snake	<i>Enhydris pakistanicus</i>	Daryai Samp
25	Beaked Sea Snake	<i>Enhydrina schistosus</i>	Chonch dar Samundari Samp
26	Annulated Sea Snake	<i>Hydrophis cyanocinctus</i>	Dhari dar, Samundari Samp
27	Slender Blind Snake	<i>Typhlops porrects</i>	Andha Samp, sampolia
28	Tiger Bull Frog	<i>Rana tigerina</i>	Maindak Dedhar
29	Indus Toad	<i>Bafo andersori</i>	Khushki Ka Maindak

Source: www.sindhwildlife.com

The Green turtle is confined to the tropical waters of both hemispheres, adults inhabiting the vicinity of marine algal growth (their main food). In Pakistan they are found on the Karachi coast of Sindh and the Makran coast of Balochistan. They are the only herbivorous species of the marine turtles as they feed solely on algae and different varieties of sea grass, depending on where they are. These turtles are threatened by human interference. The once deserted beaches of Hawksbay and Sandspit have been breeding grounds for this species for decades. However the increase in development in these areas has threatened the turtle population. Newly born turtles would seek out the sea by the reflection of ambient light of the surface of the water. The profusion of lighting by human settlements on the beach makes the hatchlings disoriented and they set out in the wrong direction where they are eaten by dogs or crows. Commercial poaching has further reduced their population, as eggs are high in demand for human consumption in parts of Asia.

Like all other marine turtles, the Olive Ridley turtles are widely distributed throughout the waters of the tropics, especially around those in the Indo-Pacific and the East Atlantic regions. They are the most common turtle on the Indian coasts. They are still considered widespread although their nesting sites are being depleted by the increase in human development on coastal properties.

They are an omnivorous species. In captivity, they have been known to feed on dead fish, crabs and other crustaceans as well as the softer parts of molluscs. They also feed on certain species of jellyfish. The main factors that threaten these turtles are the commercial harvest of adults, incidental capture in shrimp trawls and the harvesting of their eggs. Also because they feed on jellyfish they are subject to suffocation by swallowing plastic bags, which they frequently mistake for these creatures.

There is also a large population of freshwater turtles in wetlands and other areas. However, their numbers are under threat due to illegal catching and the existence of a ready market in Southeast Asia and the Middle East.

CAUSES FOR THE PRESENT SITUATION

The dwindling wildlife resources in Sindh are increasingly exposed to natural calamities and hazards inflicted by humans.

Hunting was a sport, limited to the affluent, feudal sections of Sindh. Prior to the 1960s, firearm licenses were not allotted extensively and wildlife could sustain the hunting pressure. Feudal landowners exploited wildlife for leisure and personal consumption. However, since they controlled the lands they also contributed towards the preservation of wildlife in the province. But, social and administrative changes after the 1960s, altered prior arrangements. In an attempt to control the depletion of wildlife, the government imposed rudimentary hunting laws to control excessive hunting without any significant results because game animals and birds continued to decline rapidly.

Non-arable land, once the habitat of countless Galliformes and other wildlife species, has been brought under the plough and, as a result, the wildlife habitats have either shrunk in area or have disappeared altogether.

Continuous drought, particularly in arid areas and climatic change, has resulted in natural calamities. In 1994, an extended wet period in lower Sindh was followed by abnormally high temperatures during the summer in Ghotki, Khairpur and Sanghar districts. Furthermore, the tropical cyclone of 1999 adversely affected the coastal belt of Badin and Thatta districts, resulting in large scale elimination and migration of wildlife from their original habitat.

The non-availability of job opportunities in the rural areas and the resulting poverty has upset the balance between the human population and the availability of natural resources. The poor are tempted to trap animals and birds, both endemic and exotic, in return for nominal financial returns from dealers in this clandestine and illegal trade. Thus skins of many fur animals, monitor lizards, snakes and other reptiles, besides countless bird species, are regularly trapped and sold in the market due to

the non-availability of alternate sources of income. The very custodians of wildlife such as game watchers and game inspectors are often responsible for encouraging trappers in return for bribes.

Some causes of the decline in wildlife population is due to: the loss of water in the Indus river; poor seasonal flooding and inundation of Kacho areas; low to below average rainfall after 1992; shrinking of inland waters; drying-up of dhand, dhora and conversion of wetlands into agricultural lands in the coastal belt, particularly in Thatta, Ghorabari, Mirpur Sakro, Jati, Sujawal, Mirpur Bathoro, Badin and Tando Bago taluka. In addition, wherever wetlands exist, the quality of water has become unhygienic due to inadequate recharge from natural resources and contamination from effluent and dumping of saline sub-soil water from the tubewells. This is especially true in the case of Hamal, Manchar, and Nurruri Lakes. The LBOD has destroyed the wetlands in Nawabshah, Badin and Thatta districts where these have either dried-up or been so adversely affected that the waterfowl that used to inhabit or frequently visit these areas are forced to spend winters elsewhere.

There have been attempts to monitor hunting activity. Hunting permits are issued by the Sindh Wildlife Management Board to a number of sportsmen but these permits are invariably misused. As it is, the hunting season is far too long and the wildlife that survives it, cannot sustain the pressure over a prolonged period.

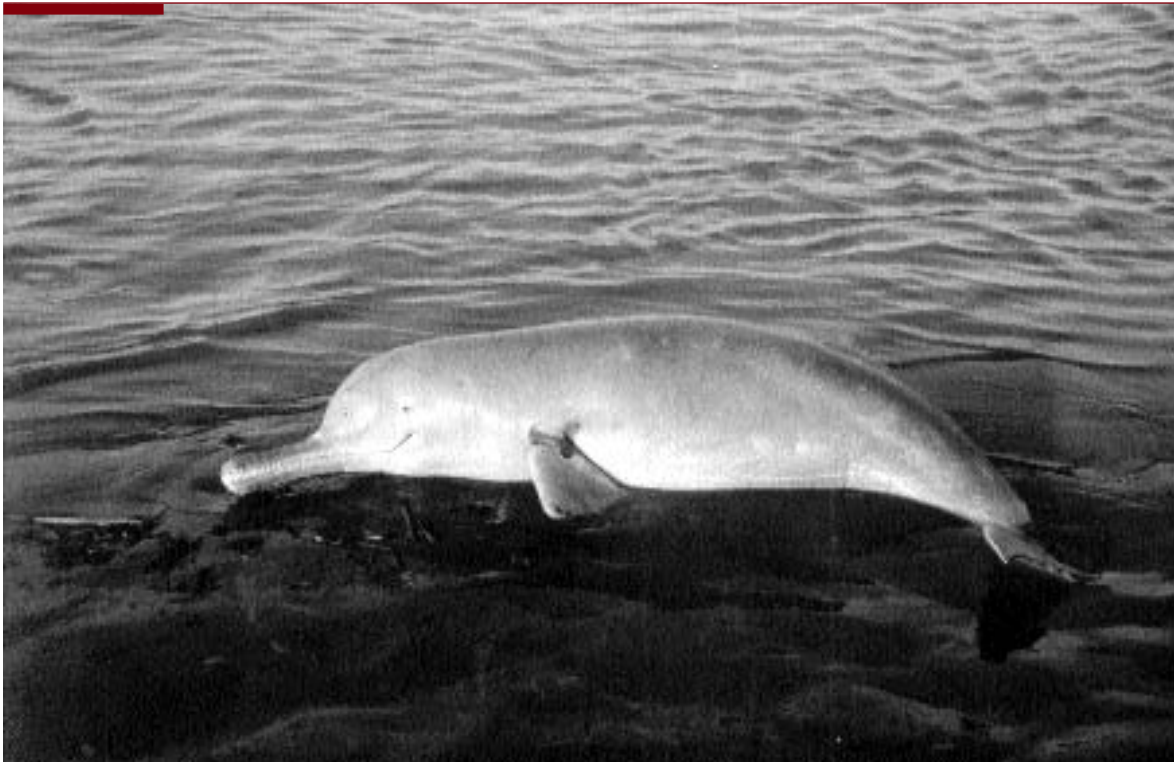
EMERGING TRENDS

Two early expeditions led by Guy Mountfort in 1967 and 1968 to assess the wildlife status of Pakistan laid the foundation for managing wildlife resources along scientific lines. The idea of creating protected areas such as national parks, wildlife sanctuaries and game reserves was introduced in the country and other recommendations were made to the government such as the creation of a separate wildlife service and its incorporation into forest services.

After 1970, the Sindh government took the initiative of drafting wildlife legislation and promulgated it as the Sindh Wildlife Protection Ordinance, 1973. This legislation has been amended from time to time, keeping in view the



Sweetwater Turtle (*Terrapin chitra indica*)



The Indus Dolphin, also known as the Blind Dolphin

requirements of wildlife protection and conservation. Kirthar National Park, covering an area of 1192 square miles, was created in the year 1975 and 35 wildlife sanctuaries and 15 game reserves were brought under the wildlife enactment.

There are a number of protected areas in Sindh. These areas contribute to the protection and maintenance of biodiversity, and of natural and associated cultural resources, managed through legal or other effective means (IUCN, 1994).

A wildlife sanctuary is an area, which is set aside specifically as an undisturbed breeding ground for the protection of wildlife⁹. It is a restricted area, the use of which is denied to the public. No exploitation of the land is allowed except for reducing fire hazards, epidemics, insect attacks or natural calamities. National Parks such as the Kirthar National Park mentioned above, are accessible to the public for and facilities for recreation, education and research are provided, however, the wildlife in these areas must not be harmed within a three miles radius of the park's boundary.

In order to control excessive hunting activity, game reserves were created. Hunting and shooting of animals in these areas are regulated under a special permit. Permits specify the maximum number of animals that may be killed or captured, the area in which it can be done and the hunting period during which these activities can be carried out.

Map 13.1 gives the location of National birds and Game Reserves and Map 13.2 gives the location of Wildlife Preservation Projects.

The Indus blind dolphin population was declining at an alarming rate before the WWF International and the Sindh Wildlife Management Board invited Dr Giorgio Pilleri, the Director of the Brain Anatomy Institute and Professor of Neuroanatomy and Comparative Neuropathology at the University of Berne, Switzerland, to study the biological behaviour and echolocation of this unique aquatic mammal. On his recommendations, the Government of Sindh created an Indus Dolphin Reserve to ensure the survival of this species in a very disturbed environment. Encouraging

9. Rao, A.L, National Parks and Reserves, The Nature of Pakistan, 1986

results have been achieved through effective conservation and scientific management which have also been documented.

A great impetus was given to wildlife conservation in 1990 when the Wildlife Department was regrouped with the Agriculture Department. A number of new schemes for wildlife management along scientific lines were launched. These included captive breeding of

endemic waterfowl species, captive breeding of Nara hog deer, biological studies of ungulates found in Kirthar National Park, establishment of game reserve in Kundah Reserve Forest, breeding of the marsh crocodile and its reintroduction in its original habitat, and multiplication trials of Black buck for introduction into wild habitats in Khairpur and Nawabshah districts. The results achieved overshot the targets that were envisaged in the

Table 13.4: Protected Areas in Sindh

S. No.	Name of Protected Area	Area(ha)	District	Habitat
1	Kirthar National Park	308733	Dadu/Karachi	Arid/Semi Arid
	Wildlife Sanctuaries			
2	Bijoro Chach	121	Thatta	Wetland
3	Cut Munarki Chach	405	Thatta	Wetland
4	Deh Akro-II	20243	Nawabshah	Wetland complex
5	Dhounj Block	2098	Shikarpur	Riverine Forest
6	Drigh Lake	164	Larkana	Wetland
7	Ghandak Dhoro	31	Jacobabad	Wetland
8	Gullel Kohri	40	Thatta	Wetland
9	Gulsher Dhund	24	Hyderabad	Wetland
10	Hub Dam	27219	Karachi	Wetland
11	Hudero Lake	1321	Thatta	Wetland
12	Haleji Lake	1704	Thatta	Wetland
13	Hilaya	324	Thatta	Wetland
14	Keti Bunder North	8948	Thatta	Wetland
15	Keti Bunder South	23046	Thatta	Wetland
16	Khadi	81	Thatta	Wetland
17	Khat Dhoro	11	Larkana	Wetland
18	Kinjher Lake	130468	Thatta	Wetland
19	Kot Dinghano	30	Nawabshah	Wetland
20	Lakhat	101	Nawabshah	Wetland
21	Lung Lake	19	Larkana	Wetland
22	Mahal Kohistan	70577	Dadu	Arid/Semi Arid
23	Majiran	24	Thatta	Wetland
24	Marho Kotri	162	Thatta	Wetland
25	Miani Dhand	57	Hyderabad	Wetland
26	Mohabat Dero	16	Nawabshah	Wetland
27	Munarki	12	Thatta	Wetland
28	Nara Desert	223590	Sukkur/Khairpur	Desert
29	Norang	243	Thatta	Wetland
30	Rann of Kutch	320463	Badin/Tharparkar	Desert& Marshy
31	Samno Dhund	23	Hyderbada	Wetland
32	Sadnai	84	Thatta	Wetland
33	Shah Lanko	61	Thatta	Wetland
34	Takkar	43513	Khairpur	Desert/Semi Desert

Source: www. sindhwildlife.com

schemes. Most of the schemes were completed in the first phase but, unfortunately, the second phase of the schemes was not implemented due to financial constraints.

Prominent wildlife conservation interventions include the change in the alignment of the National Highway Authority's Karachi to Peshawar motorway to avoid the bifurcation of the Mahal Kohistan Wildlife Sanctuary and the Kirthar National Park. The mid-winter waterfowl count initiated by the Sindh Wildlife Management Board in association with the Asian Wetland Bureau and the International

Waterfowl Research Bureau has also been initiated. A programme for the rehabilitation of the Lung Wetland by the Sindh Wildlife department has been completed. Other conservation interventions include mitigating measures to save the Marbled teal, the hog deer and marsh crocodile, which have become endangered due to the ecological damage being caused by the Chotiari reservoir.

The Government of Pakistan granted licences for the exploration of hydrocarbons through the Mineral Development Department to Premier Oil Company in the Dumbar region in Kirthar

Table 13.5: Game Reserves in Sindh

S. No.	Game Reserves	Area (ha)	District	Eco-zone
1	Deh Jangisar	314	Thatta	Arid/Semi Arid
2	Deh Khalifa	429	Thatta	Arid/Semi Arid
3	Dosu Forest	2312	Larkana	Riverine Forest
4	Hala	954	Hyderabad	Riverine Forest
5	Indus River Dolphin Game Reserve (From Sukkur to Guddu Barrage)	44200	Jacobabad / Ghotki / Shikarpur & Sukkur	River Indus
6	Khipro Forest	3885	Sanghar	Irrigated Forest
7	Mando Dero	1234	Sukkur	Semi Arid & Cultivated
8	Mirpur Sakro	777	Thatta	Semi Arid
9	Nara	109966	Khairpur	Desert & Wetland
10	Pai Forest	1969	Nawabshah	Riverine Forest
11	Sahib Samo	349	Hyderabad	Riverine Forest
12	Surjan, Sumbak, Eri & Hothiano	406302	Dadu	Arid/Semi Arid
13	Tando Mitho Khan	5343	Sanghar	Desert & Semi Arid

Source: www. sindhwildlife.com

National Park and Mahal Kohistan Wildlife sanctuary despite criticism from IUCN, the World Wide Fund for Nature (WWF) and the public. However, due to the advocacy of civil organisations, the Premier Oil Company, before starting exploratory operations in the protected areas, carried out EIA studies. Further, a baseline survey of the park area was conducted to assess the potential and the components of the park. A detailed survey of ungulates found in the park and the sanctuary has been carried out to determine the total number of animals. In this context, a committee was also set up to develop the Kirthar National Park Management Plan.

The above trends point to the development of increasing consciousness in civil society, government institutions, and the corporate sector, regarding the need for conservation of wildlife and the preservation of its natural habitats.

STAKEHOLDERS

Sindh Government

Sindh is a pioneer in organising and managing wildlife scientifically and on a sustained basis,

with active public participation. After the dismemberment of the 'One Unit' and the creation of an independent provincial administrative set up, the game department was merged with the Sindh Forest Service. Wildlife legislation was enacted to tackle the problems of this sector, under the Sindh Wildlife Management Board headed by the Chief Minister of the province. This legislation set a precedent for all the provinces to protect their endemic wildlife. The Sindh Wildlife Management Board has been proactive but the Government of Sindh has also played a part by creating a separate Wildlife Department to build capacity and strengthen the role of actors in this sector.

NGOs

The role of NGOs in wildlife conservation measures has been considerable. Along with imparting training to wildlife staff, funding species survival programmes and arranging seminars, they have impacted on school curricula by initiating orientation programmes on wildlife in schools to motivate the younger generation to preserve wildlife heritage. These include IUCN, World Wide Fund for Nature



Muhammad Anees Shehzad

Afghan Urial at Kirthar National Park



Sindh Ibex at Kirthar National Park

(WWF), International Waterfowl Research Bureau, (IWRB) and the Asian Wetland Bureau (AWB). Without their assistance, the achievements made by the Sindh Wildlife Department would not have been possible.

Individuals

Lovers of wildlife who have preserved wildlife by establishing private sanctuaries and game reserves are stakeholders too, and deserve to be mentioned. Mir Ali Murad Khan Talpur has devoted his life and assets to preserving the wildlife of Sindh at his privately managed Mahrano Wildlife Research and Breeding Reserve in Khairpur.

The Shaikh Zaid bin Sultan Al-Nahiyani Wildlife Trust has made a major contribution towards conservation and management of wildlife in Sindh. It has done so by providing a 500-acre enclosure at Khar Wildlife Research Centre, where Black buck, urial, chinkara and the goitred gazelle have been successfully bred for reintroduction into their original habitats.

The Corporate Sector

The oil and gas sector and associated agencies involved in mining and exploration activities are also a major stakeholder as their activities may have an impact on the wildlife of the area being mined. An example is that of Kirthar National Park.

The Premier Oil Exploration Company, in a joint venture with Shell Oil Company, Pakistan, was awarded a licence for exploring fossil fuel and gas, and carried out drilling operations in Kirthar National Park and in Mahal Kohistan Wildlife Sanctuary. The Premier Kufpec Pakistan (PKP) has a permanent stake in the park and the sanctuary area and has funded various wildlife management programmes besides the preparation of a Management Plan for the Kirthar National Park. They have also been providing ecotourism facilities.

FUTURE ACTION

Although the protection of wildlife involves both administrative as well as technical



Painted Zandgrouse

expertise, actively involving the local people in conservation measures has proved to be a success, especially in remote areas. There is a dearth of job opportunities in these areas and the association of energetic and young people in conservation related wildlife programmes has provided jobs and helped the sector. Salaries for these people can be raised from the proceeds of hunting and from financial assistance received from wildlife trusts of Arab dignitaries who are provided with hunting permits. This trend needs to be supported through innovative programmes and projects.

Organised publicity on wildlife issues in the popular media and inclusion in school syllabi may be of great importance. Publishing literature on the current status of wildlife in the province to give exposure to future generations also needs to be promoted.

There is a no institution in the province that imparts training in wildlife management with the result that trained personnel for this discipline are not available. A university course on wildlife management may be introduced at any one of the universities in Sindh.

The declining numbers of game birds suggests that instead of alternating opening and closing hunting areas each year, the department should regulate this by carrying out a census of endemic game birds after the breeding season is over. Based on such a census, the number of birds to be hunted on each permit and the span of the hunting season can be determined.

Since it is not possible to restore wildlife habitats in the agriculture zone, farmers can be provided incentives to provide refuge and cover to birds. This can be done by raising small wood-lots or grove plantations for roosting; and carrying out land development to leave scattered brush and scrub jungle where the birds can breed easily and escape from predators.

The experience gained from establishing game reserves in forests such as Pai, Khipro and Kundah, could be used to establish similar game reserves in every civil district. Game birds can thereby be provided a chance to breed and maintain their existence despite pressure from hunters and poachers.

Game farming is generally practised all over the world for the purpose of sport, and there



Black Bucks at Mehrauo

are possibilities of establishing such farms in the private sector. The government can encourage individuals who are inclined to establish private game farms. The incentives in the form of subsidised soft loans, import facilities for raising game birds, game animals, and expertise can be provided to initiate hunting as an industry.

The proceeds of trophy hunting shared between local people who work for the protection of wildlife and the staff, have brought

encouraging results elsewhere in the country. It is suggested that this practice be adopted in the game reserve areas of Sindh to curb illegal hunting and reduce the chances of poaching.

The devolution of power has taken place at the provincial level but the department of wildlife has not been devolved to the district. If protection of wildlife is devolved to the district levels, there may be more public participation and the chances of wildlife conservation could perhaps be addressed more effectively.



PART III

Brown Sectors





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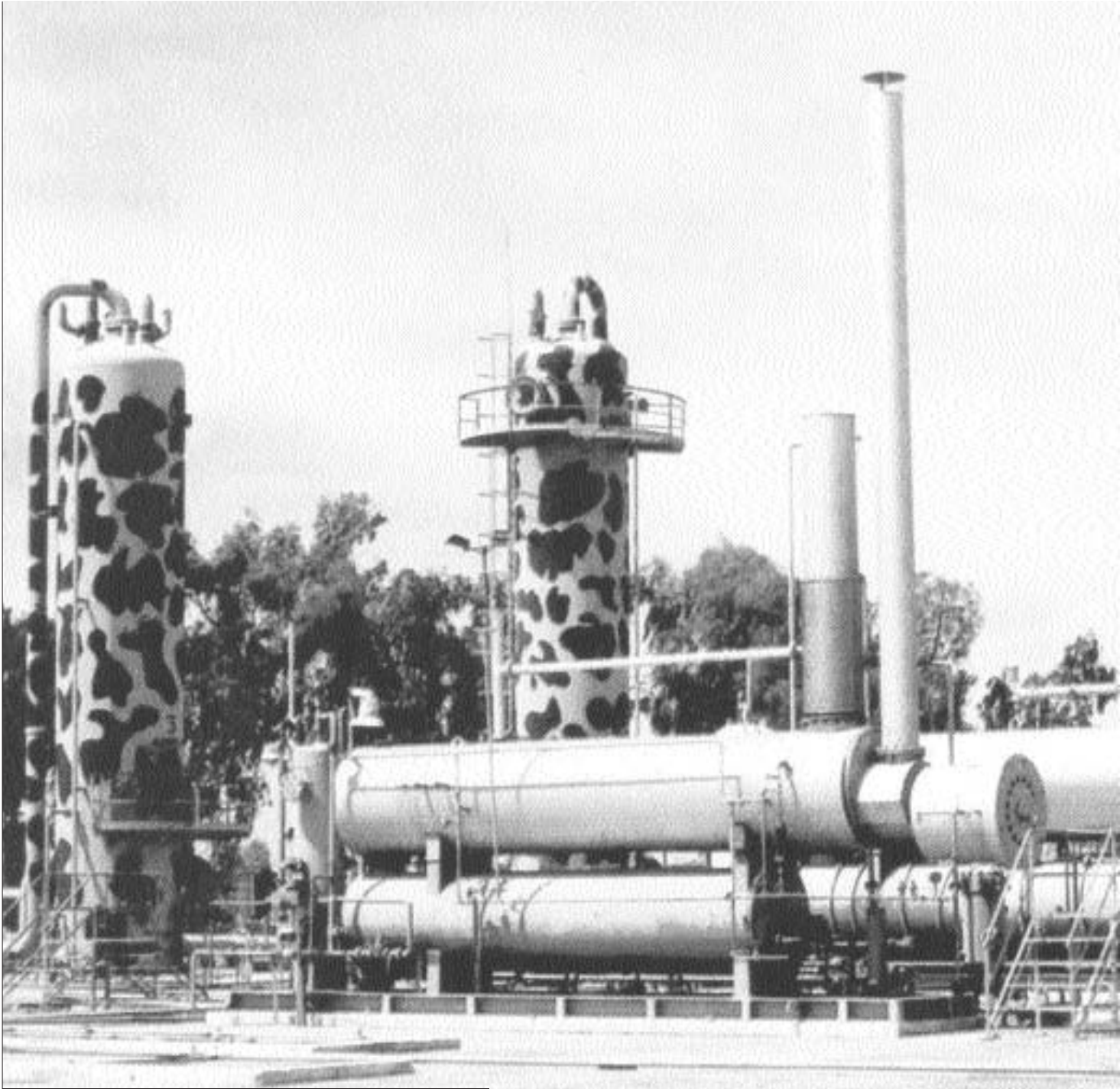
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CHAPTER 14

Minerals and Mining



During the period from 1990 to 2000-2001, Sindh earned Rs. 1,018.938 million as royalty from its large mineral deposits. This excludes the revenue generated from oil deposits. The national economy has undergone drastic changes over the last three decades in the composition of the GDP. However, the mining and quarrying sector grew by 3.8 percent between July 2001 and March 2002, with major contribution by coal and natural gas which grew by 2.5 and 5.6 percent, respectively.

Presently, Sindh is a major producer of oil and gas. About 60 oil and 44 gas fields have been discovered with the average daily production of oil of up to 34,794 barrels per day and 422,432 million cubic feet of gas per year (412,604 million cubic feet as associated gas and 9831 million cubic feet as non associated gas). Thus more than 56 percent oil and 37 percent gas of Pakistan's daily production is in Sindh. Beside oil and gas, 26 minerals from Sindh, contribute to the national economy. These, along with the revenues they generate, are given in **Appendix 14.1: Total Revenues Earned in Rupees from Minerals in Sindh.**

Before 1947, few minerals except coal were known for Sindh. Later, the Geological Survey of Pakistan (GSP) and Mineral Development Corporation were established, but these departments worked primarily on exploring minerals. However, after the secession of East Pakistan, the Mineral Development Department was established in 1971, which began carrying out Mineral Assessment Schemes in 1985. As a result, a few new minerals were discovered but little was done in terms of mineral prospecting and exploration.

For exploring oil and gas deposits, Burmah Oil Company drilled the first well in Sindh in Khairpur in 1925. After 1947, the pace of exploration for oil and gas accelerated when Pakistan Petroleum Limited discovered gas in Khairpur (1957), Kandhkot (1959) and Mazarani (1959). At the same time, Stanvoc Oil Company (SVOC), which later became Esso, discovered the Mari gas field in 1957. SVOC also drilled wells in Talhar (1957), Mirpur Bathoro (1958), Nabisar (1958) and Badin. Nabisar showed some gas deposits while Talhar showed both oil and gas. Burmah Oil Company (BOC) and Hunt Oil Company drilled wells at Lakhra (1958), Badhra (1958-59) and Phulji (1958) where only national gas was discovered.

In 1961, the Oil and Gas Development Corporation (OGDC), was established and they discovered gas at Sarisingh (1966), Kothar (1973) and Hundi (1977). This was also the time when the coastal area of Sindh witnessed spurts of explorations. Sun Oil Company drilled on-shore wells at Korangi Creek (1965), Patiani Creek (1964) and Dabbo Creek (1964) with no success.

The discovery of Khaskheli Oilfield in 1981 was an important event, and the area became important for further exploration. A large number of oil and gas fields have been discovered since then.

After 1947, minerals of economic importance such as building stones, limestone, celestite, Fuller's Earth, some poor quality coal, glass sand, gypsum, flint stone and alum shale were discovered in Sindh.

Limestone is found extensively in the hilly tracts of Sindh and is used in the manufacture of cement. Three sizeable cement factories are working in Karachi, Hyderabad and Rohri. Celestite occurs in the form of veins in foraminiferal limestones near Thano Bula Khan. Fuller's Earth is found extensively interbedded with limestone from Gaj to Ranikot. The best occurrence of Fuller's Earth is in Khairpur along the base of the foraminiferal limestone scarp in the hills east of Khairpur town. It also occurs near Thano Bula Khan and Hyderabad, and near Jhimpir and Jherruck railway stations. Some poor quality Fuller's Earth occurs in the Gaj limestone cropping in Karachi.

Coal, or lignite, occurs as a thin seam in the Sonhari beds of the Upper Ranikot series near Jhimpir, Meting and in Lakhra. Glass sand is found around Jungshahi in Thatta district in considerable quantities but is of moderate quality.

Gypsum in crystal form and fibrous veins occurs in tertiary clays and shales over a large part of western Sindh. Gypsum is used for cement-making. Flintstone, in the form of nodules, is associated with limestone of the Eocene age. The most accessible locality where large quantities are found is around Rohri and in the adjoining hills of Khairpur. Alum was previously prepared from pyritous shale obtained in the hills of western Sindh but this was discontinued because of the low price of imported alum.

Minerals, too, are now being widely used in many industries. Cement industries are being set-up in the province utilizing limestone and gypsum and clay is used in ceramic tile manufacturing factories. However, there is a need for establishing more mineral-based industries in the province.

Table 14.1: Foreign Direct Investment Inflow in Mining and Quarrying

Year	USD (Million)	% Share FDI
1997-1998	99.1	16.5
1998-1999	112.8	23.9
1999-2000	79.7	17.0
2000-2001	84.7	26.3
2001-2002*	121.7	42.3

Source: Economic Advisor Wing (July-March)

The Foreign Direct Investment (FDI) in the mining and quarrying sectors was 17 percent in 1999-2000, but continued to increase thereafter (Table 14.1). Its share in total FDI increased to 42.3 percent in July-March 2002, as against 26.3 percent in the previous year. Overall, mining has emerged as the largest recipient of FDI.

COAL

The history of coal mining in Sindh dates back to 1852. Coal from all the fields in Sindh is lignite to sub-bituminous and occurs in the basal parts of the tertiary sequence, ranging in age from 50 to 60 million years. The major coalfields are in Lakhra, Meting-Jhimpir, Sonda and Thar. Table 14.2 highlights production and revenue earned from coal in Sindh.

The Lakhra coalfield in Dadu District lies 16 km to the west of Khanot railway station on the Kotri-Dadu section of the Pakistan Railways and covers an area of about 200 km². The Meting-Jhimpir coalfield is lignite A to sub-bituminous B in rank. It is soft and friable and suffers from spontaneous combustion on exposure.

Analysis of coal from Sonda coalfield, situated close to the national highway linking Karachi with Hyderabad, indicates it to be a relatively low sulphur coal as compared to other Pakistani coals.

The presence of coal in the Thar desert was first indicated in the drilling for freshwater by British Overseas Agency in 1988 near the village of Khario Ghulam Shah, about 15 km east of Islamkot. This has led to a modest four-borehole coal test drilling programme by GSP, Sindh Regional Office in Thar since 1992. These are the thickest coal beds yet found in Pakistan, with a maximum thickness of 30 meters.

Refer to Map 14.1 for Location of Coal Deposits in Sindh

OIL AND GAS

Details regarding oil and gas fields in Sindh and their outputs and issues are covered in Chapter 17: Energy Resources of Sindh.

Table 14.2: Production and Revenue Earned from Coal in Sindh

Location of Mines/Lease	1998-99		1999-2000	
	Production (in Tonnes)	Revenue (in Rupees)	Production (in Tonnes)	Revenue (in Rupees)
Thatta	6143	292658	12896	2660940
Dadu	1267026	1756292	981662	442442
Tharparkar	N. A	N. A	N. A	10380

Source: Director General, Mines and Minerals

REPERCUSSIONS OF MINERAL EXPLOITATION

The exploitation of mineral resources is an environmentally damaging activity causing large scale deforestation, and the destruction of wildlife and other socio-economic resources. It costs the local people their homes, their grazing grounds, burial grounds, and even their livelihoods (for details see **Appendix 14.2: Environmental Impact of Mining**). The private companies given contracts by the government mining authorities seldom care for the indigenous people and for the destruction they bring to their lives.

The mineral sector which ranks third in Pakistan after industrial and agricultural sectors, respectively, earns more than Rs.101 million for Pakistan annually. Unfortunately, the mining and exploration processes, particularly those used in coal mining, are obsolete, nomadic and slow. For underground excavations, axe and pick methods are used, and surface minerals are collected by hand. It is imperative that this sector be modernised and mechanised for optimum benefit.

Old and abandoned mines of marble and coal in many parts of the provinces have had an adverse effect on the environment when open pits and deep, long tunnels are left which pose a threat both to the safety of humans, animals, and the environment. The pits are often very steep and cannot be reclaimed by soil coverage or by plantation.

The underground mining of coal in many parts of the province, does not lead to such drastic disruptions of the surface as open pits, but soil subsidence can take place. Excess pumping of water from the mine areas can lead to the collapse of ground surface. This problem occurs most often where rocks are naturally weak or highly fractured and have not been properly supported. This happens often in the Lakhra coal mines. Subsidence has also resulted in the destruction of homes, roads, and agricultural land.

In strip mining, once the bulk of the coal has been mined, the remnants of the exhausted, coal-bearing rock and soil, known as mine spoil waste also poses a threat to the environment. This waste needs to be covered and the topsoil vegetated to minimise acid mine drainage problems which is seldom done.

Impact on Water Resources

Pollution from mining is microbial and gives rise to many water-borne diseases. In Sindh, contamination, usually by metals, toxic waste, and chemicals, may cause environmental pollution over a wide area by changes in the distribution and chemistry of surface or groundwaters. For example, in the Lakhra coal mines, the acid mine drainage that is produced when the iron sulphide minerals (pyrite, marcasite or pyrrhotite) are exposed to oxidation by moist air to form sulphuric acid, plus various other compounds in ore deposits and dumps, is a major source of concern. At Lakhra Power Station, 45 cusecs of water is brought from the nearby Indus. After utilising this water, about 480 tonnes/hr of wastewater is drained back without being treated¹.

Coal mining activities near the main water channels, like the KB Feeder supplying water near Sonda coalfield areas, can be particularly hazardous, if proper remedial measures are not taken to avoid spillage into the water system.

Hazards of Coal Mining on Air

Coal mining produces air pollutants which include dust, carbon monoxide, sulphur dioxide, oxides of nitrogen, hydrogen sulphide and trace metals which may be a serious health hazard. Dust is capable of causing a substantial negative impact in the immediate areas of release. Dust is released from every surface mine, especially from coal mines and other quarries. It arises from mines, waste piles, beneficiation and conversion plants, transportation facilities, stockpiles and industrial sites.

1. Thardeep Rural Development Programme. 2002 Socio-economic and Environmental Aspects of Coal Mining in Tharparkar District. Mithi

The primary impact on the air quality results from burning the coal in an uncontrolled or spontaneous fire, in mines or stockpiles. Combustion of coal in brick kilns or electric power plant releases about 4,500 tonnes of sulphur (in the form of sulphur oxide). Depending upon the local meteorological condition, pollutants may either be carried long distances by air currents or they may accumulate in high concentrations under more stagnant conditions once released into the atmosphere.

EMERGING TRENDS

Minerals are a provincial subject under the Constitution of Pakistan, except for oil, gas and strategic commodities like radioactive minerals, and those occurring in special areas such as FATA and the Northern Areas. In line with the constitutional framework, federal and provincial governments formulated the National Mineral Policy to provide appropriate institutional arrangements, a modern regulatory framework, an equitable internationally competitive fiscal regime, and to expand Pakistan's geological database.

According to the policy, the focus of all the activities and decision-making was to be made at the provincial level and the federation was expected to provide requisite support and advice for achieving sustainable benefits. The establishment of two high-powered bodies, one at the provincial level and the other at the federal level were approved.

A political consultative forum, the Mineral Investment Facilitation Board (MIFB), under the chairpersonship of the prime minister and the vice-chairpersonship of the federal minister for petroleum, has been set-up with its secretariat at the Ministry of Petroleum and Natural Resources. The scope of MIFB is to advise the authorities concerned for appropriate action to encourage flow of investments in the mineral sector and review proposals for its enhancement. In addition, MIFB is to assist provincial governments in the selection of suitable mineral sector portfolios for introduction by the provinces to donor agencies and investors.

A new regulatory regime is being introduced to replace some of the features considered



Imdad Siddiqui

Lakhra coal field, District Dadu

unattractive to the investors in the old regulatory regime. This change will put in place a set of rules which are internationally competitive and meet the concerns of the investors on the matters of transparency, criteria for dealing with applications, and the grant of licenses and leases, security of tenure, provision of information on mineral title, independent dispute resolution mechanism and so on.

STAKEHOLDERS

Stakeholders in the mining sector include: the Department of Mines and Mineral Development, Government of Sindh; Sindh Coal Authority (see Box 14.2: Sindh Coal Authority); the federal government and its departments; multinational oil companies; mine owners' associations; labourers and mine labour organisations; local residents; environmentalist groups; and the media.

Department of Mines and Mineral Development

The Government of Sindh, under the Secretary Mines and Mineral Development, governs this

department. The department regulates minerals and mines and collects rent and royalty. It leases out mining areas under the Pakistan Mining Concession Rules 1960, now known as Sindh Mining Concession Rules 1973. Some of the organizations working under it are:

- Directorate of Industries and Mineral Development
- Chief Inspector Mines
- Sindh Coal Development Authority
- Lakhra Coal Development Corporation

Federal Government and its Departments

The Department of Natural Resources, Government of Pakistan, also regulates minerals, especially fuel minerals. The oil and gas sector is controlled by it. The following departments fall under the Ministry of Natural Resources:

- Geological Survey of Pakistan, Sindh Regional Office

- Pakistan Mineral Development Corporation
- Oil and Gas Development Corporation
- Director General, Petroleum Concessions

Mine Owners' Association

This association coordinates between mine owners who are actively and commercially engaged in the mining sector.

Mine Labour Organisations

These include registered mine labour organisations that fight for the rights of mine labourers.

Environmental Groups

These groups monitor the environmental impact of mining and fight for the imposition of regulations regarding the environment.

Media

Newspapers, radio and television help to highlight the mining development in Sindh.

Box 14.1: Impact on the people

Impacts on the social environment due to mining activity in an area are unavoidable. These impacts vary in extent and magnitude. The major social impact associated with large-scale mining is a rapid influx of workers from other parts of the country. Labour is brought from as far off places as Mingora and Swat and paid wages as low as Rs.200 for mining one tonne of coal from under 200 feet below sea level. Most of the workers suffer from pneumoconiosis, silicosis, and other environment-related diseases. Local services like water supply, sewage, demand for rented houses, schools, hospitals, and transport come under pressure due to an increase in the population.

The mineral bearing fields are found in really remote parts of the province, which are the least developed with little or no social and physical infrastructure. Moreover, mining is carried out under pitiful conditions and labour laws are seldom implemented.

Presently, over 40,000 workers are employed in the mining industry of Sindh, of which as many as 22,000 are engaged in coal mining. The number of serious accidents during 1993 was 65. As many as 41 people were killed and 80 were injured. Explosions of dust and natural gas kill and injure coal miners on a regular basis. Several fatal accidents occur due to carbon dioxide and monoxide emissions, collapse of mine roofs and explosions due to methane gases.

Besides mining accidents, it has also been observed that during mineral exploration, the various stakeholders do not adhere to mine safety laws.



Coal Miners in Indus Coal Mine

Educational and Training Sector

- Miner's Training Centre, Khanote, District Dadu
- Department of Geology, University of Sindh
- Department of Geology, University of Karachi
- Department of Petroleum and Gas, Mehran University of Engineering and Technology
- Department of Mining Engineering, Mehran University of Engineering and Technology

To attain sustainable development of the mineral sector in Sindh, national and international mining companies have founded a coal miners' training institute near Lakhra coalfield at Khanote. The provincial government

Box 14.2: Sindh Coal Authority

The province of Sindh contains 95 percent of the coal reserves of the country. The Thar coalfield, one of the few biggest coal fields in the world, comprises about 80 percent of total coal deposits of the country. Realising the importance of coal as an indigenous and a reliable fuel for electric power generation, the Government of Sindh established the Sindh Coal Authority under the Sindh Coal Authority Act 1993, passed by the Sindh Assembly. The authority is responsible for:

- a. Development/harnessing of coal resources of the province on a fast track basis with special emphasis on developing coal as a fuel for electric power generation.
- b. Preparation of policies, plans, and schemes for the acceleration of coal development activity in the province mainly through the promotion of private investment.
- c. Taking appropriate steps for promotion of foreign investment.
- d. Assisting investors in resolving their problems, thus enabling them to concentrate on the implementation of their projects.

has also established a police station there for the protection of miners. Union Texas Inc. (now named as BP Pakistan Exploration and Production Inc.), has also established a mono technical institute in Petroleum Technology at Badin near Khaskheli oilfield. According to their Memorandum of Understanding, jobs and other social benefits are to be offered to the locals by the mineral/oil companies.

Oil & Gas Companies Operating In Sindh

- Oil & Gas Development Company Limited (OGDCL)
- Oil Petroleum Inc. (OPI)
- Tullow Pakistan Development Limited
- OMV
- Orient Petroleum Inc. (OPI)
- Bow Energy Resource (Pak)
- SRL
- Zaver Petroleum
- Premier Oil
- Petroleum Exploration (Pvt) Ltd (PEL)
- Sherritt International Oil & Gas Ltd (Canada)
- Novus (Pvt) Ltd (Australia)
- Shell
- Lasmo Oil Pak - ENI

FUTURE ACTION

No scientific survey has ever been carried out in Sindh, or in Pakistan, for that matter, to gauge the adverse environmental impacts of mining on human health. No specific data is available but it is speculated that the health of the miners suffers due to terrible physical and social conditions. Added to the strain of long working hours in inadequate lighting conditions, inhalations of coal dust, insufficient oxygen and lack of proper ventilation, is the intense noise pollution of mining. Miners are known to suffer

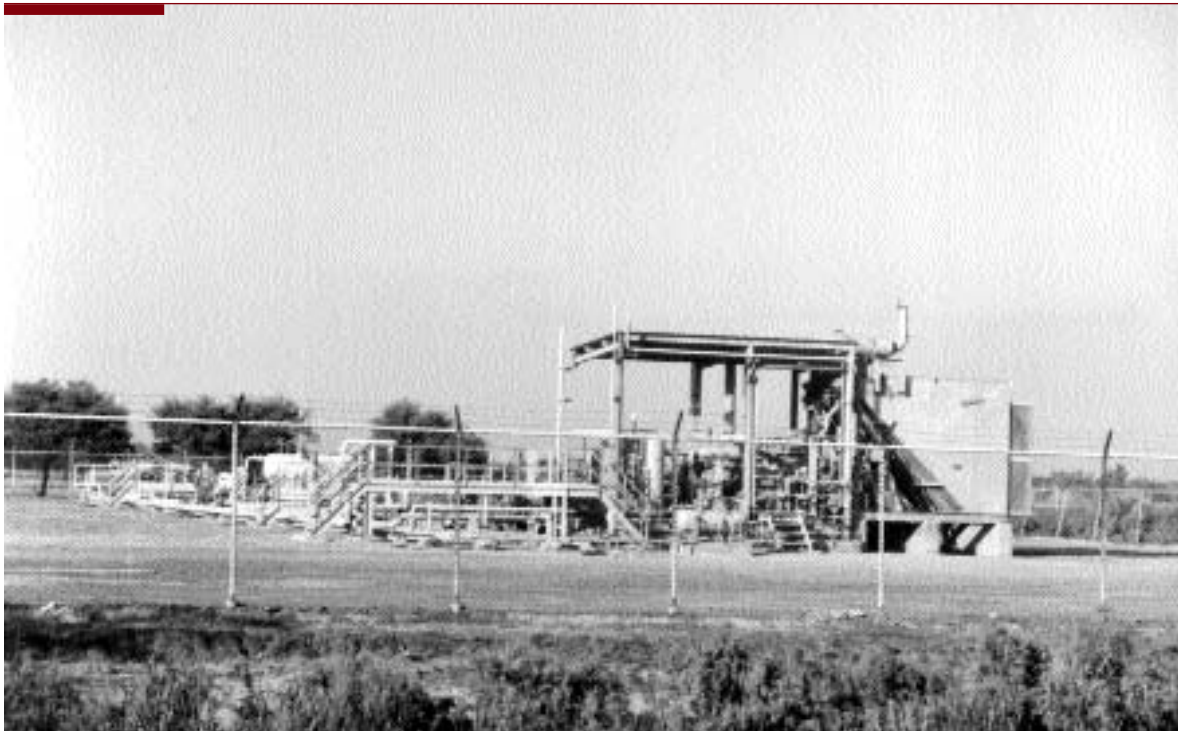
from black lung disease, a form of emphysema caused by prolonged breathing of coal dust and other particulate matter. Implementation of mining safety laws is not currently followed. It is therefore imperative that in all mining areas a full-fledged hospital is established and miners are properly treated. These conditionalities need to be observed both by the government and the private sector.

In the year 2000-2001, Sindh earned a substantial Rs.147.4 million from mining, but there is a need for exploring new minerals. Financial assistance needs to be provided to the mining sector and the import of mining machinery should be made tax free so that mechanised mining may be encouraged in the province.

A separate wing or cell for the exploration of minerals needs to be established in the Department of Mines and Mineral Development. This wing or cell could employ mining engineers, drillers, and other technical staff and a five-year target could be fixed for the exploration and development of minerals.

While Sindh is earning huge amounts from the mineral sectors, the areas such as Lakhra, Sonda, Meting, Jhimpir, and Tharparkar remain underdeveloped. They lack basic infrastructure such as roads, water, and electricity. There is a need to develop them with the cooperation of mine lease holders, as well as communities like mine labour organizations and foreign investors and donors.

The emission of sulphur oxides and particulates during the coal-burning process is extremely harmful and significantly adds to environmental and health problems². A secondary effect of gaseous emission from the coal-fired Lakhra Power Station may cause acid rain. Environmental pollution control must be incorporated into each stage of coal fuel cycle. An Environmental Management Cell with appropriate training facilities needs to be established in each thermal power plant. Environmental impact assessment needs to be conducted for each individual project to place on record the potential impacts and appropriate mitigation measures.



Oil field in Badin: Sindh is the largest fossil fuel producer in Pakistan

Mining authorities need to be made aware of the villages coming within the mining fields that are not mere names on the map but areas where people have lived for generations. They must be taken into confidence while making major decisions, and should be considered primary stakeholders. The selection of private companies to handle mining must be made on the basis of their willingness to invest in appropriate technologies aimed at protecting the natural as well as the socio-economic environment. Concern for the indigenous people and the sustainability of their culture and livelihoods must reign supreme.

A training centre was established by WAPDA at Jamshoro Thermal Power Station for training workers for coal-fired power stations but due to financial crises it has remained inoperative for

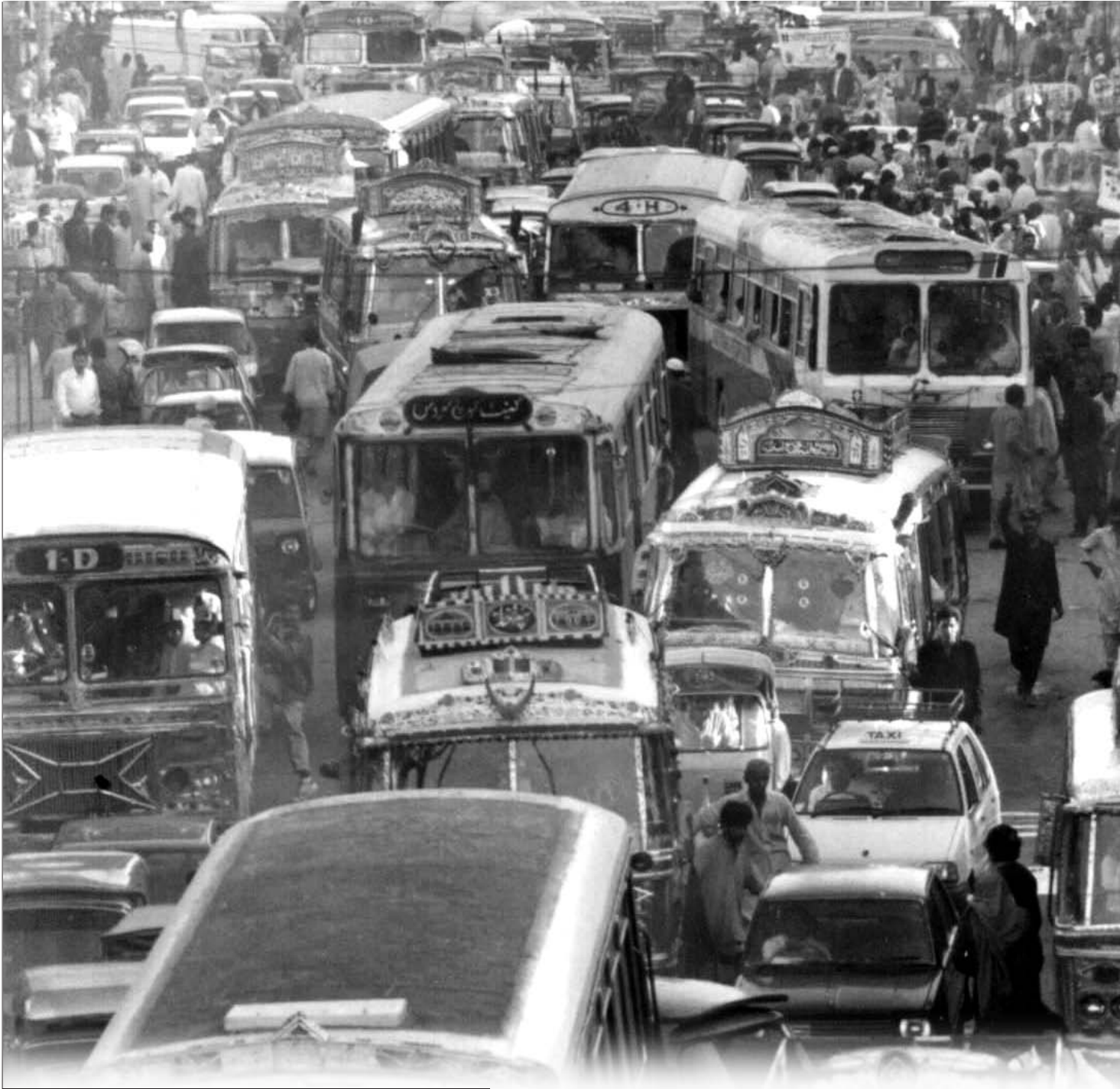
the past three years³. The centre needs to be made functional and future skilled and unskilled people may be trained there for the Thar Coalfield Power Stations.

Subjects pertaining to mining and power should be introduced in polytechnic institutes in addition to separate diploma courses on Power Technology and Mining.

A separate Sindh Mining Training Board should be established⁴ to plan and implement human resource development and utilization programmes in coal mining technology. With the provision of the Apprenticeship Training Ordinance extended to the Thar Coal Mining Project, the latter will be able to develop trained and skilled manpower.

3. Ibid

4. Ibid



CHAPTER 15

Urbanisation and
Urbanisation



Sindh is the most urbanised province of Pakistan due to the fact that Karachi, its capital city is the largest urban centre of the country. Understanding the environmental repercussions of urbanisation are therefore particularly pertinent to the development of Sindh.

Sindh has an urban population of 14.84 million (out of a total population of nearly 30 million) living in 163 urban centres, including ten cantonments¹. This constitutes 48.9 percent of the total population of the province, which is much higher than the percentages for Pakistan as a whole (32.5 percent), Punjab (31.3 percent) Balochistan (23.3 percent) and the NWFP (16.9 percent), respectively. Demographic data for the province since 1901 is given in Table 1 of **Appendix 15.1: Demographic Data Sindh**. Table 2 in Appendix 15.1 gives the rural / urban bifurcation and illustrates the first major increase in the urban population which occurred between 1941 and 1951. This was due to the migration from India in 1947. The effect this migration had on the demography, sociology and politics of Sindh is discussed later in this chapter.

The table in **Appendix 15.2: Pakistan Main City Population Data 1998** shows that urbanisation in Sindh is very different from the rest of Pakistan. None of the provincial capitals of the other provinces contain a majority of the urban population resembling Sindh. Also, Sindh's three major cities (Karachi, Sukkur, and Hyderabad) contain 71 percent of the urban population of the province whereas the five main cities of the Punjab contain a mere 48 percent. As does NWFP, however the 48 percent is distributed amongst three main cities². This is because Karachi, Pakistan's only port and its major business and industrial centre, is in Sindh. This reality determines the nature of urbanisation in the province.

With its somewhat better infrastructural facilities and employment market, Karachi continues to exercise a strong pull on the population of the lesser developed regions of Pakistan. It has a population of 9.269 million or 63 percent of the total urban population of Sindh according to the 1998 census. Unofficial estimates raise this figure to 13 million, or ten percent of the population of the country. In addition, 20 percent of the country's Gross Domestic Product (GDP), 45 percent of value added, 40 percent of employment in large scale manufacturing, 50

percent bank deposits, 25 percent of federal and 40 percent of provincial revenues are contributed by Karachi³. In spite of this, 75 percent of Karachi's labour force is employed in the informal sector, which contributes 50 percent to Sindh's industrial production⁴.

The percentage increase in population during the 1981-98 period for Karachi was 77.97 percent, for Hyderabad 54.38 percent, and for Sukkur 72.25 percent, as against a Pakistan urban average of 78.19 percent and a Sindh average of 51.61 percent⁵. From this, it is evident that only Sukkur and Karachi are attracting rural-urban migration, and also that there is inter-city or urban-urban migration taking place from Hyderabad whose population has recorded a lower growth than average. Map 15.1 show the location of urban settlements in Sindh.

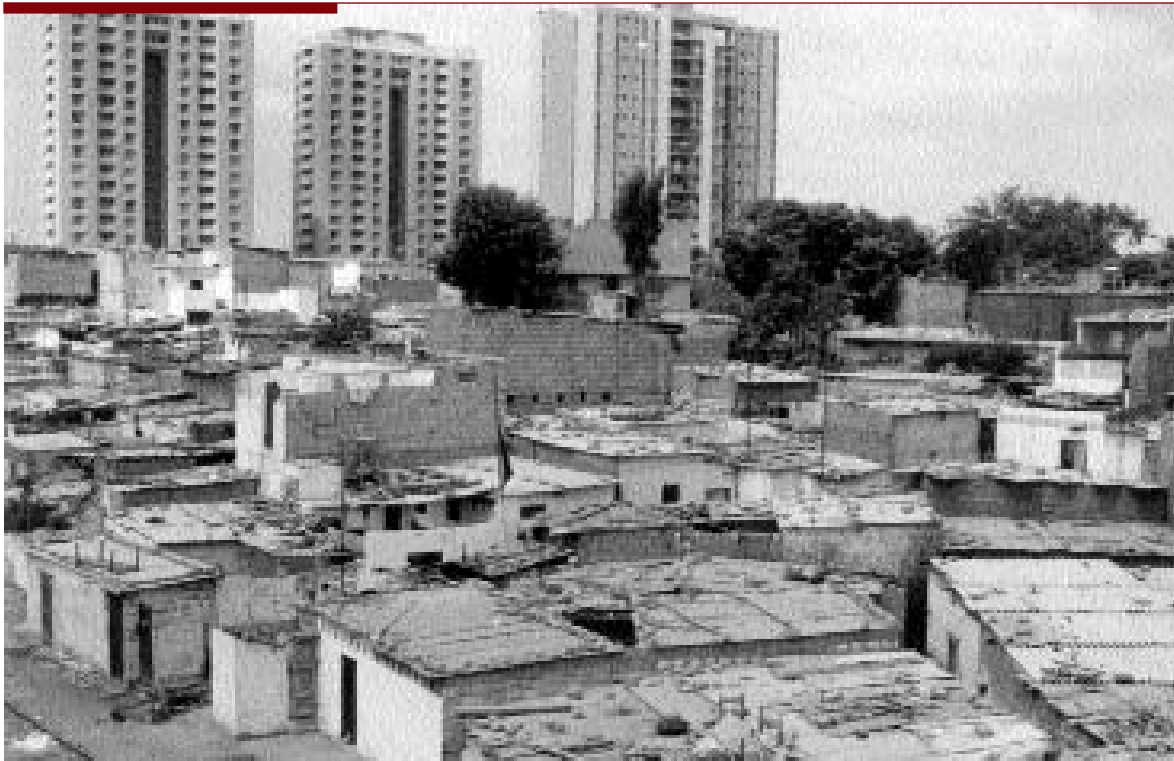
PHYSICAL CONDITIONS

Physical development indicators for the urban areas of Sindh do not, on an average, present a favourable picture even though they are much better than the indicators for the rural areas. Table 1 in **Appendix 15.3: Physical Conditions in Sindh**, shows us that there is congestion (3 persons per room), piped water is available to only 68.2 percent of the population, and independent latrines to only 50 percent of the dwellings. Also, only 50 percent houses have an RCC roof. However, electricity connections are available to 93 percent of houses⁶. The table also shows that conditions have not improved considerably since 1980 when the earlier census was taken. Despite this, (Table 2 in Appendix 15.3) conditions are better than the Sindh average. Physical conditions in urban Sindh do not compare well with the Pakistan average either, except for Karachi.

SOCIAL CONDITIONS

Almost 50 percent of Sindh is urban. As compared to the rural areas, the indicators are much better but as compared to the urban

1. Government of Pakistan, 1998 Provincial Census Reports, Population Census Organization, Islamabad, GoP, 1998
2. Source: Arif Hasan, Urban Change: Scale and underlying causes - The case of Pakistan; City Press Karachi, 2002
3. Khuhro, H and Mooraj, M. 1997. Karachi: Megacity of Our Times. Oxford University Press, Karachi
4. MP&ECD-KDA, Karachi Development Plan 2000, KDA 1989
5. Government of Pakistan, Population Census Reports, 1998
6. Source: Arif Hasan, Urban Change: Scale and underlying causes - The case of Pakistan; City Press Karachi, 2002



A *katchi abadi* in Karachi

areas of the Punjab they are marginally poorer. The disparity between rural and urban Sindh is enormous and has been discussed in Chapter 3. These differences (related to literacy, declining number of married women in the age group of 15 to 24 years, and populations below 5 years of age) are rapidly increasing. In the urban areas, the use of television, a negligible gap in male and female literacy in Karachi (which constitutes 62 percent of the Sindh urban population), and declining marriage rates, are producing a new, emancipated society. The younger generation, which will be between the ages of 20 and 30 in the next five to six years will diverge from the older generation and ingratiate themselves into the contemporary world.

Urbanisation has brought in its wake a major social revolution. New ties have replaced old clans and tribal affiliations. Economic pressure is forcing women to seek jobs outside their homes. Nuclear families are replacing age old extended family setups. The younger generation, unlike their migrant parents and grandparents, are not pioneers. They are city dwellers who are rapidly losing their links with the rural areas. Also, traditional community

organisations and clan affiliations have become weak and in the case of Karachi, non-existent. Therefore, there is an urgent need for strong state and municipal organisations to replace the customary ones. If this does not happen, anarchy and violence are bound to emerge.

The development of a society with urban values requires recreation and entertainment which reflect the culture and aspirations of urban dwellers. Unfortunately, this has not happened in Sindh. On the contrary, the political culture of the state has damaged the entertainment and recreation facilities that did exist in the 1970's and early 1980's. Owing to government policies, cinemas have closed down all over the province. Twenty-eight of them have been demolished in the central districts of Karachi alone, thus wiping out one of the major sources of family entertainment. Schools of dance and music were also closed down in the 1980's and, due to censorship on the performance of plays and musical programmes, such functions have become difficult, if not impossible to stage. There has been a decline in the standards of museums and zoos, and a cutback on government expenditure on the promotion of art, culture and recreation.

However, the parks, beaches, and funfairs of Karachi and other cities are full of people on weekends and days off. Also, on holidays, the city streets all over Sindh are full of young boys playing cricket. This is a reminder that open spaces are not available to the younger generation for sports and recreation.

Despite the negative aspects mentioned above, religious festivals are celebrated with considerable enthusiasm and public involvement. *Ramzan*, *Muharram* and *Dewali*, are all big events, where apart from religious rituals, people also socialize, play traditional sports and arrange *melas* to celebrate these holidays.

HOUSING

Sindh requires about 120,000 new housing units annually for its growing population. However, the formal sector is able to provide no more than about 40,000 housing units. Karachi requires 80,000 units per year whereas only 27,000 building permits are issued by the building control authorities in the city⁷. This huge demand-supply gap is met by the development of *katchi abadis* or squatter settlements on state land, through the informal subdivision of agricultural land, densification of the inner cities or is simply unmet. The *katchi abadi* is strictly speaking, illegal, whereas the subdivisions of agricultural land have no law to support them. In both cases, the settlements are un-serviced and acquire services through self-help or ad-hoc political patronage. In Karachi, it is estimated that 32,000 housing units are developed in the *katchi abadi* every year⁸.

Half of the population of Karachi and Hyderabad live in *katchi abadis*. The government of Sindh has a *Katchi Abadi Improvement and Regularisation Programme (KAIRP)*. The Programme has been in operation since 1978 but has failed to meet its target because of complex procedures, absence of community participation, dependence on foreign loans and official corruption. These hindrances have declined considerably after 1992, when the Sindh Katchi Abadi Authority (SKAA) initiated a

more innovative programme to deal with these issues.

There are 1,293 identified *katchi abadis* in Sindh of which 1,157 have been marked for regularisation. They have an estimated population of 3.53 million, a figure that does not include settlements created out of the informal subdivision of agricultural land that have not been identified as *katchi abadis*.

The vast majority of the working class of urban Sindh lives in such settlements. Since they are increasingly being developed away from the city centre, the residents have immense problems commuting from their homes to their places of work. This factor also increases their commuting costs considerably. Many of these unregulated settlements are being demolished to make way for commercial plazas and middle income apartment housing, even though demolitions are carried out in violation of existing government policy. In Karachi alone since 1992, 7,438 housing units in the *katchi abadis* have been bulldozed⁹. Development projects have also caused large scale displacement of urban populations. For example, the Lyari Expressway in Karachi will be displacing 25,000 families. These displacements are increasing the housing problem and also create social conflict since no proper alternatives are provided to the evacuated population.

The distance of the *katchi abadis* from the city centre also means that they are disengaged from better health, education, recreational, and cultural facilities, which adds to their impoverishment. The Orangi Pilot Project (OPP), an NGO working in the informal settlements of Pakistan, has identified sanitation, employment, health and schooling as the four main problems in the *abadis* and has developed models of community participation and local resource mobilisation to tackle these problems. The project has received international acclaim and recognition.

The absence of social housing programmes for urban areas is increasing informal housing

7. Hasan, Arif. 1999. Understanding Karachi. City Press, Karachi

8. Ibid

9. Ismail, Aquila. 2002. Evictions. City Press/URC, Karachi

projects. A major problem this poses is the future integration of ad-hoc informal developments, both in physical and social terms, into a larger plan for the city. The failure to bring about such integration is bound to increase societal and class conflict.

There are considerable sociological differences between the *katchi abadis* and the planned areas of urban Sindh which are evident in the social indicators of different low income settlements. These are shown in Table 1 and 2 in **Appendix 15.4: Social Indicators of Different Types of Settlements in Karachi**.

LAND USE CHANGES

Major land-use changes have taken place as a result of urbanisation. This is especially true of Karachi and Hyderabad. The most important alteration is the acquisition of agricultural and pastoral land for urban development. In the case of Karachi, 1,200 *goth* (villages) and their pasture areas have been absorbed by the expanding city. As a result, the people have lost not only their homes but also their traditional sources of livelihood. The best agricultural lands were also located around the towns in the irrigated areas. These too have been lost, along with their orchards and gardens. In addition, areas that were demarcated as protected green areas by various development plans have been taken over by developers and also by *katchi abadis*. This has been possible because of a powerful politician-developer-bureaucrat nexus which has rendered most development and land-use plans ineffective. Through this nexus, developers are able to violate by-laws and zoning regulations, encroach upon compulsory open spaces and even build on natural drainage channels and infrastructure reservations. This has happened all over Sindh, creating severe environmental problems, especially related to the disposal of storm water. For example, in Karachi Development Authority (KDA) Scheme 33 in Karachi, 827.3 acres of amenity spaces for parks, playgrounds, educational and health facilities have been taken over illegally for commercial development¹⁰. The Karachi Building Control



Muhammad Anees Shehzad

Drinking water supply line passing through the polluted Lyari River

Authority (KBCA), which is supposed to implement zoning regulations, has failed to do so. As a result, there is congestion, absence of important urban facilities, and inadequate infrastructure. SHEHRI, a Karachi based NGO, has taken up these issues and has struggled for the implementation of zoning regulations by the KBCA through advocacy, court cases, and lobbying.

The absence of any formal provision for the establishment and increase of small scale industry, warehousing, storage and private sector health and education facilities, has also led to major land-use changes. Most informal sector industries function from the *katchi abadis* that do not have the necessary infrastructure to support them. As a result, warehousing and storage has encroached onto the narrow streets of the inner cities of Karachi and Hyderabad. Due to this densification, the middle classes have moved out of old neighbourhoods and have been replaced by lower income groups that work in the markets and warehouses as labour. Since a large part of these are migrants,

10. Hasan, Arif. 1999. Understanding Karachi. City Press, Karachi

many of the old neighbourhoods of Karachi's inner city have become male-only enclaves. Due to these social and physical changes, the rich architectural heritage of the inner cities has been badly damaged and much of the old community buildings are no longer used for their original purposes. Similarly, even in the affluent urban neighbourhoods, houses have been converted into private schools and clinics and readily available for commercial and industrial use. This causes considerable inconvenience to the residents of areas surrounding them.

WATER

Water is available to those urban areas of Sindh that are in close proximity to the irrigation network. Cities that are far away and have no potable subsoil water have severe problems and are faced with uncertain water availability. This includes Karachi, where the net availability is only 350 MGD as against a requirement of 600 MGD¹¹.

Potable groundwater (available only in 28 percent of Sindh land mass) used in urban

areas, is invariably contaminated with salts drained from the drainage basin, in addition to sewage, industrial effluent, and residues of fertilizer and pesticides discharged by the wastewater disposal systems. Seventy-three percent of the farms in Sindh use fertilizer and 23 percent of the farm areas are provided with pesticide cover. The irrigation drainage channels carry these toxic pesticide and fertilizer residues drained from the fields. Since LBOD and RBOD have not been effective in discharging the drainage effluent into the sea, the toxic effluent has been accumulating in the soil and moving slowly into the groundwater sources. Unless this is prevented, water will become a severe danger to health conditions in the province.

DISPOSAL OF EFFLUENT

In the absence of proper disposal and treatment facilities, municipal and industrial effluent in Sindh is discharged into the nearest drainage canals, depressions, water channels, rivers, or the sea. The wastewater from Sukkur is released directly into the River Indus, which



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A view of Lyari River with polluted water in Karachi

11. Ibid



Mounds of garbage dumped in city streets in Karachi

from Hyderabad is discharged into the Phuleli Canal, and sewage water from Kotri is discharged into the Kalri Baghar canal that brings water to Karachi. Karachi's effluent goes directly and mostly untreated into the sea.

Sewage collection and disposal is available in Sindh to approximately three million of the urban population, 28 percent only. The unserved population includes *katchi abadis*, the industrial areas, as well as the informal manufacturing sector located in residential areas and commercial areas. A part of the untreated, discharged wastewater is used for farming purposes. The produce of this wastewater is a major health hazard. However, as wastewater increases, so does the area using it for cultivation.

In Karachi, there is provision for the treatment of only 80 MGD of the over 250 MGD of sewage generated by the residential and industrial areas of the city¹². Only 25 percent of this 80 MGD capacity is utilised since the sewerage system to carry it to the treatment plants is not in place. The untreated sewage is discharged

as a raw mix of sewage and industrial waste into the seasonal Lyari and Malir Rivers. These two streams were dry *nalas* in the past but are now perennial sewage streams that discharge into the Manora Channel and the Phittee Creek. Due to this, seawater in the Manora Channel as well as the Phittee Creek is highly contaminated and has resulted in the loss of biodiversity in the aquatic life.

SOLID WASTE DISPOSAL

The management of municipal solid waste in all the urban centres of Sindh comprises neighbourhood garbage dumped at a *kachra kundi* from where it is taken by trucks and dumpers and hauled to distant landfill sites. In the small towns, only an estimated 30 to 40 percent of solid waste is picked up. Out of this, only 50 to 70 percent is transported to a dumping site, which in most places is undeveloped. Most municipalities undertaking collection and removal activities do not have proper transportation fleets, nor do they have the finances for the regular operation and

12. Ibid

maintenance of vehicles. The remaining solid waste is picked up by scavengers for sale to middlemen who then transport it to the recycling industry in the larger cities.

Karachi generates a very large volume of solid waste and also has a large recycling industry. Details regarding collection and disposal are given in Table 15.1. Details related to the recycling industries and their relationship to the municipal authorities and middlemen are given in Box 15.1: Waste Pickers and the Recycling Industry. There is an urgent need to formally integrate the recycling industry into the solid waste management strategy for Karachi, for without their participation, it will be increasingly

difficult to develop an efficient system of waste disposal.

Karachi has only two official dumping sites located to the west and north of the city¹³. These are rather difficult for the southern and eastern parts of the city to access. Since these sites are underdeveloped a large number of informal sites (many of them along creeks and beaches) have cropped up recently, creating immense environmental hazards for the natural and the constructed-environment. In addition, residents and municipal authorities are forced to burn solid waste in neighbourhoods where waste cannot be lifted. This causes further deterioration to the environment.

Box 15.1: Waste Pickers and the Recycling Industry

About 700 tons of recyclable waste is collected from the KMC neighbourhood garbage dumps or *kutchra kundi*, as they are called. This activity is carried out by about 21,000 waste pickers, most of whom are young Afghan boys who work in groups of 5 to 20. Each group is linked to a "contractor". For their convenience, waste pickers scatter the waste on to public spaces around the *kutchra kundi*, creating large scale environmental pollution. The pickers then separate paper, plastic, rags, bone and metal, and carry them to sorting places in large plastic bags. If the sorting point is near the *kutchra kundi*, the pickers physically carry it there or use bicycles. If it is far, a donkey cart or a Suzuki pick-up is hired for this purpose. Most of the sorting places are located near the *nala*, under bridges, in open spaces meant for parks and playgrounds, in abandoned public latrines and even at bus stop sheds. The contractor pays *bhatta* for the use of these spaces to functionaries of government departments who own the space or to neighbourhood toughs and to the police. KMC garbage collection crews and drivers do not lift litter from the *kutchra kundi* regularly so as to help the pickers in their work. In return, the contractor pays the KMC drivers and crew between 50 to 150 rupees per day. In addition, the cost of the diesel saved by not making the journey from the *kutchra kundi* to the distant landfill sites is also pocketed by the KMC staff.

The sorting point is operated by a contractor who hires four to six boys to separate different items and to pack them in separate containers. From here the packed waste is taken to Sher Shah for primary recycling, or to dealers who are also located in Sher Shah, for refined sorting. Alternatively, in a few cases, it is taken directly to factories in Korangi, New Karachi, Orangi and in Sher Shah for reprocessing or is sent to factories in the industrial cities of the Punjab. Pick-ups and, sometimes, trucks are used for transportation. Since these vehicles are overloaded, they pay 150 - 200 rupees per trip as *bhatta* to the traffic police. In addition, 10 - 15 rupees are paid at every police *chowki* (post).

Paper and bone are the two main items that are collected from the dumps. Other sort of waste such as plastic, glass, and metal are removed at home by housewives and sold to the kabari. Paper is turned into cardboard and bones are boiled to remove grease from them. The grease is used for detergent factories and also for soap making while the bones are ground and mixed with poultry feed. The grease-removing process is very polluting and since these factories are located in dense residential areas in Sher Shah, there is constant conflict between the residents and the factory owners.

After fulfilling duties at the dumps during the day, pickers invade all the city markets, even in high income areas, after they close at around 7:30 pm. Here the contractors and sometimes the pickers as well, pay the market administrators, caretakers, and shopkeepers for the waste they collect.

Source: 25 years of Sindh statistics GOS, 1998 and SFD records

13. Ibid



Traffic congestion in Karachi has reached an alarming level

In Karachi, hospitals dispose hazardous waste through the Karachi Municipal Corporation (KMC) that is responsible for collection from about a 100 hospitals, clinics, laboratories, and similar institutions. The KMC has six vehicles for this purpose and two incinerator plants at Mewashah that were installed in 1999. However, newspaper reports suggest that this collection and disposal is not efficiently carried out, and it serves a very small percentage of the total hospitals and clinics in the city.

VEHICULAR TRAFFIC

Traffic volume in Sindh has escalated tremendously over the last 55 years and so has the level of air pollution on the main roads of Karachi and in other urban centres. For instance, according to reports the vehicular traffic of Karachi city has increased by a factor of 32 in 40 years. Statistics illustrate that the number of vehicles in the city has risen from

Table 15.1: Solid Waste Collection and Disposal in Karachi

	Tonnes Per Day
Separated by housewives	800
Separated by waste pickers	700
Fuel for kilns	350
Used for land reclamation	350
Lifted by KMC	2,200
Not picked up (most of it dumped in natural drains)	2,200
Total	6,600

Source: Hasan Arif, Understanding Karachi, City Press, Karachi, 1999

20,000 in 1948-49, to 646,582 vehicles in 1988-89. There may be close to a million vehicles on the city streets of Karachi in the daytime. This amounts to over 50 percent of the vehicles in the province as a whole. The natural consequence of the increase in vehicular population is congestion and an increase in the level of air and noise pollution.

AIR POLLUTION

According to a recent study by UNICEF, 81 percent of children under age five in Sindh develop acute respiratory infections, which is the highest figure amongst the four provinces of Pakistan. Much of this is because vehicles emit a substantial quantity of lead and carbon monoxide into the air. In a study conducted in Karachi, the highest smoke concentration was found to be at Tibet Centre, where it was 270 ug/m³ in 1975, 598 ug/m³ in 1982 and 623 ug/m³ in 1983. This high level of pollution has resulted in increased respiratory tract infections, which are what nearly 23 percent patients coming to Civil Hospital, Karachi, are suffering from. In addition, several studies have been conducted to document the high level of lead in the atmosphere. These studies show that schoolchildren and policemen studying and/or working in those areas of Karachi where there is heavy traffic congestion have dangerously high blood lead levels¹⁴. The main source of lead is exhaust fumes from automobiles, lead-based paints and battery smelting factories¹⁵.

NOISE POLLUTION

Various studies have shown that long term exposure to high levels of industrial noise can cause a degree of hearing loss. Nearly 50 to 60 percent of the workers in a plant with a noise level of about 150 decibels (db) have been reported to be losing hearing capacity. The other non-industrial sources of noise include vehicular traffic, loudspeakers, radios, television, music systems, construction work, trains and aircrafts.

Karachi is the hub of industrial and commercial activities in Sindh. In 1994, a survey was carried out to assess the degree of noise pollution in Karachi. Noise analysis data was collected for 16 hour periods and carried out in 72 selected sites. The local train whistling up to 113 db was the worst polluter. The national Logistic Cell (NLC) trawler emitting 96 db and blowing its horn at 109 db came next. The others included an old taxi (average 98, peak 107 db) motorcycles (average 93 db, peak 110 db) and auto rickshaw (average 92 db, peak 102 db). Noise levels varying from 87 to 99 db were found at the harbour, the vegetable meat markets and music shops. At night, the noise in restaurants peaks at 94 db. Even in hospitals, high noise levels (81 to 82 db) were found¹⁶. The acceptable noise level is 85 db.

Rapid urbanisation is contributing towards the emission of noise from traffic. Increase in the number of vehicles, traffic jams, defective vehicles, and poor roads, all contribute towards noise pollution. Although industrial estates have been demarcated away from residential areas, the unplanned *katchi abadi* not only leads to extemporaneous industrial activity but exposes the residents to noise and air pollution.

TRANSPORT

Transport is an essential part of urban life. In Sindh, the public sector has completely withdrawn from providing transport at the intra city and the inter city levels. Through the promotion of a free trade policy, the private sector has taken over the provision of transport facilities. A major transport problem exists in Karachi where about 13,000 substandard mini-buses cater to the needs of the vast majority of the commuting public. There is no infrastructure to support these services. There are very few bus terminals, depots or workshops. All these activities are carried out along the roads creating congestion and strong objections from the residents of the areas where such transport plies. These mini-buses are purchased by individuals (sometimes more than one individual) on credit from financiers who act

14. Beg, M.A.A. "Report on Status of Air Pollution in Megacities". Karachi: Past, Present and Future prepared for World Health Organization, June, 2001

15. Ibid

16. Beg, M. A. A. Status Paper on Urbanization of Sindh, prepared for the IUCN, 2002



Northern bypass flyover bridge at Karachi, an example of improving infrastructure

collectively as a mafia. The buses have a close link with the law enforcement agencies and thereby violate all traffic laws with impunity. Recently, attempts have been made by the city government and the Sindh Ministry of Transport to introduce better bus services through the private sector.

Efforts to build a mass transit system for the city have also been undertaken. Rs. 3.5 billion have gone into developing various mass transit options. These options include: the revival of the existing Karachi Circular Railway (KCR) and its extension into the suburbs; the construction of elevated light rail transit ways on existing roads; and, more recently, proposals for a mono-rail system. For most of these proposals, tenders on a build, operate, and transfer (BOT) basis will be invited through international tenders from multinational companies, since the government does not have the funds for Karachi's mass transit needs. It is feared that the BOT system will raise construction costs and hence the average cost per trip may become unaffordable for the poorer commuters. Citizens' groups have also objected to the adverse environmental effects of building elevated transit ways through the

narrow corridors of the old city as this will not only block out light and air but will also encroach upon public space and obstruct the view to a number of important historical buildings of the city.

INSTITUTIONAL ARRANGEMENTS

Major changes have taken place in the institutional set up in Pakistan after the enactment of the 2001 Devolution Plan. Before that, in Sindh there were four municipal corporations (cities with over 500,000 population), 36 municipal committees (populations between 25,000 and 500,000) and 123 town committees (populations of less than 25,000). The planning and implementation for infrastructure of the town committees was carried out by the provincial line departments. The municipal committees however, had some expertise but depended heavily on the line departments as well. The cities which had municipal corporations also had development authorities that were in-charge of planning and implementation of structure plans and

infrastructure development. However, after the Devolution Plan, which has been described in Chapter 23, each district has been divided into *tehsil* and each *tehsil* into union councils. Each *tehsil* has a population of approximately 500,000 and each union council is supposed to have between 50,000 and 60,000.

CAUSES FOR THE PRESENT SITUATION

Institutional Issues

Urban planning in Sindh has been carried out with the help of donors like the UNDP and UNCHR (Habitat). They were the planners for the Karachi Development Plan 1974-85 and 1986-2000 as well as the Sindh Secondary Cities Project. The Karachi Master Plan 1974-85 covered the present Karachi division, four *taluka* of Thatta, two *taluka* of Dadu and Hub *tehsil* of Balochistan. The foreign consultants determined the form of the plan without considering local constraints. National expertise, especially from academic institutions,

was not utilised. Another similar exercise was initiated in 1986 to formulate the Karachi Development Plan 2000. The plan was finalised in 1991 at the cost of Rs. 430 million. No local expertise was involved nor was a proper evaluation of the planning process or local stakeholder consultation undertaken. None of these plans were given legal cover. Consequently, they never became law and could be violated. In addition, there are over twenty-five development organisations and departments and at least a dozen major landholding agencies that govern urban development. There is no coordination between them and conflicts about the control of their areas ensue.

The unmitigated rural-urban migration to Karachi and Sukkur in the last decade and to Hyderabad and Sukkur during the earlier decades after 1947, have led to the decay of the urban, physical and social environment. The weakness of the planning machinery and the results of its failure were identified in the Fourth Five Year Plan document.

Previous plans have suffered a similar fate. The Greater Karachi Plan prepared in 1949 and set



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A view of Northern bypass Karachi, near Shershah

Table 15.2: Migrants Status of Population in the Urban Areas of Sindh and Punjab 1981- 98 (in thousands)

Movements of Immigrants	Total	Punjab	Sindh
Total urban population	42,898(100.0)	23,019(100.0)	14,480(100.0)
Non-migrants	35,990(83.9)	19,520(84.8)	12,288(82.8)
Total migrants	6,909(16.1)	3,499(15.2)	2,552(17.2)
Migrants within Pakistan	4,496(10.5)	1,747(9.6)	1,603(10.8)
Migrants within the province	2,456(5.7)	1,747(7.6)	459(3.1)
Migrants from other provinces	1,869(4.4)	365(1.6)	1,099(7.4)
Migrants from AJK and NA	172(0.4)	105(0.5)	45(0.3)
Migrants from other countries	1,530(3.6)	798(3.5)	661(4.5)
Migrants who did not report	882(2.1)	484(2.1)	288(1.9)

Source: Government of Pakistan, 1998 Provincial Census Reports, Population Census Organization, Islamabad, Government of Pakistan, 1998 District Census Report of Islamabad, Population Census Organization, Islamabad, as reproduced in: Iffat Ara and Arshad Zaman Asian Urbanization in the New Millennium, Country Chapter, unpublished work, August 2002.

to become effective in 1952 was shelved. The UN assisted Newcomb Plan prepared in 1958 was only partially implemented. Two master plans were prepared one in 1974 (Karachi Master Plan 1974-85) and the other (Karachi Development Plan 2000) for 1985-2000. Both of them were not implemented because of lack of political support.

In 1983, the World Bank prepared a Sindh Urban Sector Memorandum to address the growing concerns of "dualism between Karachi and the rest of the province and the lack of diffusion of the benefits of economic growth". The memorandum concluded that there was a case for deflecting some of Karachi's growth to Sindh's secondary cities, as long as the strategy was not counterproductive to the overall economy.

Also, under the above plan, industrial expansion of the SITE area in Karachi was to be curtailed and two new industrial areas were to be developed in North Karachi to alleviate unemployment and to take advantage of the super highway leading to the hinterland. The other new area, Pipri, was selected because of its proximity to the new port of Bin Qasim, the steel mills, and to the main rail and road arteries in East Karachi. The plan recommended sites for sub-metropolitan trade and service centres and proposed green belts separating industrial from residential areas in the north of the city.

As a result, a Master Plan Department was established to facilitate the implementation of the plan, assist in the preparation of updates, and to monitor development. In addition, the federal government adopted a number of policies to decentralize economic activity. The government introduced fiscal incentives such as a regional bias in the tax holiday structure to encourage decentralization of large-scale industries. However, a review of this policy as well as of the Sindh Urban Sector Memorandum shows that none of their recommendations were implemented and, consequently, the plan had a negative impact on the development of Karachi.

It is apparent from the above that the institutional arrangements for the development and implementation of urban planning have not worked in the case of Sindh.

Population Explosion and Migration

The population of Sindh grew rapidly from 4.381 million in 1941 to 6.054 million in 1951 and 8.374 million in 1961. The ecology of the province changed completely after the 1947 mass migration from India due to the sharing of limited resources with one-and-a-half times as many people as in 1941. The urban centres of the province absorbed about twice their population without the development of any new

infrastructure. There was an addition of about five million people during each decade thereafter. The population was 14.158 million in 1972, which increased to 19.029 million in 1981 and to 29.991 million in 1998¹⁷.

The rural-urban migration rate for Pakistan was set at over 600 people per day, and showed rural migration to be the main cause for growth in urban populations. For Sindh, the addition of five million people each decade, suggests an addition of over 1,350 persons a day, which is evident not only of intra-provincial rural to urban migration but also urban to urban and inter-provincial migration (Table 15.2 illustrates this well).

The Failure of Equitable Industrialisation

Between 1958 and 1968, the government decided to industrialise the country according to advice from the Harvard Group. Much of this took place in Karachi and hence promoted inter-provincial migration. To regulate the growth of cities and to balance development activities, the government put a ban on new industries in Karachi and provided incentives for industrialists to make investments in less developed areas. This met with little success as the alternative areas lacked the necessary infrastructure. These areas included secondary or intermediate cities such as Jacobabad, Shikarpur, Larkana, Khairpur, Nawabshah, Sangarh, Tando Adam, Mirpurkhas and Tando Allahyar.

The migrants to the urban areas were anxious to improve their quality of life while the government had no resources to introduce development. An informal sector developed to cater to their housing and employment needs. As a result, 75 percent of the urban population is employed in the informal sector and 50 percent of industrial production is from informal industries.

There was also a large transfer of population during the decade 1977-1987, when a large number of rural residents left their homes for security reasons. Security conditions in the rural areas of Sindh had deteriorated to the

extent that anarchic break-ins and robbery and kidnappings for ransom had become common.

The migration to the Middle East of unskilled workers in 1972/73 and then their return in 1986/87, led to the development of a consumer culture and the emergence of a middle class in what were previously working class urban and rural communities. This in turn led to further migration from rural to urban areas.

Other Causes

Lack of financial resources has been one of the causes for the non-implementation of plans. For the first decade after 1947, the government was preoccupied in trying to settle 1.8 million refugees from India. This migration had already resulted in massive environmental degradation due to the absence of infrastructure. The failure to implement subsequent plans due to financial constraints increased this degradation considerably. Lack of rural infrastructure, especially farm to market roads, and waterlogging and salinity, has increased rural-urban migration and also rural and urban poverty.

Another reason for skewed urbanisation was the complete neglect by planners of the fact that rural and urban areas cannot develop in isolation and that planning must be accompanied by, and coordinated with plans and programmes of agriculture, industries, transport, communications, water and power.

Whatever plans were prepared for the urban areas of Sindh were not provided legal cover. This is because the provision of legal cover was not a priority for the politicians who use land and developmental contracts for the purpose of providing patronage to their supporters. As a result, urban planning in Sindh has been addressed in an ad-hoc manner. This has resulted in the failure of government to provide housing, social sector facilities and employment to the poorer sections of the urban population. The informal sector has, in effect, replaced the functions of

17. Source: Arif Hasan, Urban Change: Scale and underlying causes - The case of Pakistan; City Press Karachi, 2002

the state. No attempts have been made in the various development plans to support this informal sector or to integrate it into the planning process.

There have also been constant changes in the local bodies of Sindh creating confusion, insecurity, and an absence of vision in their staff and development authorities. Also, they have been denied their rightful share in property tax, road tax, and motor vehicles tax. There has also been considerable financial indiscipline due to the absence of a process of accountability and transparency in the development sector and in the local government in Sindh.

STAKEHOLDERS

Federal Government Agencies

Federal government agencies operative in urban Sindh include the Karachi Port Trust, Military Land and Cantonment Boards, Pakistan Steel Mills and Port Qasim Authority. All these agencies own land in Sindh and are involved in the planning and development of infrastructure for the province. The Federal Ministry for Environment is also an important stakeholder since it develops guidelines for environmental policies which have to be followed by the provincial governments. Industry is also a federal subject, and given the fact that Sindh is the most industrialized of provinces, policies related to this sector have important repercussions on the physical and social environment of the province.

The Sindh Environmental Protection Agency (EPA)

The Sindh Environmental Protection Agency (EPA) is responsible for regulating environmental issues in Sindh. Since these issues cut across many sectors, the EPA has to coordinate its work with a host of government, non-government and informal sector stakeholders.

Provincial Government Departments

If the Rural Development Department can effectively improve the environmental and economic conditions in the rural areas, migration to the cities would be contained. The Housing and Town Planning Department of the provincial government is the major policymaker for urban development for the small towns of the province. Similarly, the urban development authorities that fall under the jurisdiction of the Planning Department are major stakeholders. The provincial department of transport is an important stakeholder as well, since transport is a major issue both at the intra-city and inter-city levels in Sindh.

District Governments, *Tehsil* and Union Councils

Under the new Devolution Plan the planning and implementation of various levels of physical and social infrastructure and its subsequent operation and maintenance is the responsibility of the district government, *tehsil* and union councils. Seeking funds for this development and coordinating their work with other relevant provincial and federal agencies is also their responsibility, establishing them as major stakeholders for urban development.

Formal and Informal Service Providers

There are a large range of formal and informal service providers linked to water supply, sewage and sanitation, solid waste disposal, energy supply, telecommunication facilities, land allocation, building and development in the private sector, transportation, health care, education, industrialization, industrial estate and the provision of security.

Civil Society Organisations and NGOs

Civil society organisations and NGOs are important players in the urban context of Sindh. They are involved in issues related to human

rights, water and sanitation management, consumer rights, environmental conservation, labour rights, research and advocacy on urban issues, and support to the less privileged communities and settlements of the cities.

FUTURE ACTION

The most important need for the urban areas of Sindh is the development of realistic plans that take into consideration the potential of the existing interest groups and the state's financial constraints. However, for this to become possible, a proper mapping of the cities of Sindh is required with details of their social, physical and environmental conditions. Based on this documentation, trends should be identified with existing good practices promoted and adverse ones regulated. Geographical Information Systems (GIS) should be used for the development of these plans and GIS know-how should be consolidated in the relevant planning, monitoring and revenue collection agencies.

The new local body system established by the Devolution Plan of 2001 should be

strengthened. This can be done by establishing effective master plan departments in Karachi, Hyderabad, Sukkur and Mirpurkhas, which can support the planning of the smaller towns. The plans developed by these departments should have legal cover and should be prepared with the active participation of all formal and informal stakeholders.

Some of the issues that need to be addressed are related to the development of mass transit systems for Karachi, the removal of traffic congestion on the roads through better management practices, the creation of wholesale markets off bypasses so as to decongest inner city areas, the development of effective solid waste management systems that seek to integrate informal practices into municipal programmes, water conservation practices including plugging of leakages, incentives to builders and developers for creating housing for the middle and higher income groups, integration of the informal housing market into government policy for social housing and a realistic plan for sewage disposal and treatment. Significant changes will also be required in energy strategies and practices to stabilise the emissions of



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Green areas are being promoted within city limits

greenhouse gases and leverage noise and air pollution.

The success of these programmes and projects relies entirely upon accountability and transparency in the planning and implementation stages. This can be done by advertising the project or programme at the conceptual phase; inviting objections and suggestions to it through public hearings; establishment of a steering committee of interest groups to monitor its design development and implementation; regular publication in the press regarding its accounts; and the engagement of one official who should be responsible for the project from its initiation to its completion.

However, to do what has been recommended in the previous paragraph, strong institutions and human resources are required at various levels and disciplines. Planning and urban design should be introduced in the Graduate and Post Graduate curriculum at the relevant universities of Sindh. These courses should use the urban

areas of the province as their workshop and should be socially responsive to local conditions. Courses in the urban and social geography and supportive IT discipline may also be introduced. Architecture schools and engineering departments should make their curriculum relevant to the problems of the urban areas of Sindh. No discipline can deliver unless it has the required professionals and technicians. There is also a need to establish and/or rehabilitate polytechnics and technical schools. Environment-related school curricula must be developed so as to produce a future generation that has urban values and understands environmental issues. Another important discipline is urban management and its various sub-disciplines.

In addition to professional expertise, administrators, councillors, nazims and naib nazims require orientation and guidance. There is a need to develop training institutes for this purpose. Maybe the revival of the Metropolitan Training and Research Institute at Karachi needs to be considered.



CHAPTER 16

Industrial Development

A

gricultural and mineral resources are representative of the nature of industries in Sindh. Fourteen percent of Pakistan's wheat production, 43 percent of rice, 25 percent of cotton, 30 percent sugarcane, 30 to 50 percent

vegetable crops, and 12 to 50 percent fruit crops are

produced in Sindh¹. In addition, livestock and fisheries are major outputs. These resources are being exploited through a vast network of small-scale industries such as rice, flour and oil mills, ginning factories, farm products processing units, brick kilns, sugar mills and cement factories. Most of these cottage industries are family-owned businesses and do not employ a large labour force.



Sindh's industrial units, except for those concerned with consumer products, were till mid-2002, closing down either because of the higher costs of production; the unfavourable law and order situation; and/or because tax holidays granted for a certain period were no longer available. Some investors took advantage of bank loans and preferred to declare the units bankrupt so that their debts would be written off. As a result, an increasing trend is observable where investors are switching over from manufacturing to trading or the services industry.

The strategy for industrialisation in Sindh promoted the creation of planned industrial estates and an engineering base. The first industrial estate to be established was the Sindh Industrial Trading Estate (SITE) beyond the Lyari River in Karachi in 1947, which was meant to be the industrial hub of the country, not just Sindh. SITE Karachi was provided with infrastructure such as water, roads and a sewerage network with the specific condition that it would be used only if the effluent from the factories was treated according to the requirement of the Factories Act of 1934. The plants and systems put up by industrialists were not equipped to treat the effluent. It was argued that this would raise the cost of production. Instead of rejecting this argument, the state allowed the industries to pollute the air and water systems. Industrial estates in Landhi (1953), Korangi (1959) and North Karachi townships (early 1970s) were established subsequently².

The establishment of industries brought about intensive land-use change, much of which was not foreseen or planned for. This caused considerable degradation of the physical environment. Unlike SITE, Korangi, or Landhi, in the North Karachi Industrial Estate, space for small scale and medium size units, and for building of stores and warehouses was provided. The managers of these units did not take into consideration the environmental degradation that they would cause because of the high population density.

SITE was not profit-oriented. Plots were allotted at nominal rates and infrastructure was provided by the state. The SITE engineer was authorised to allot land, provided entrepreneurs were committed to establish industries on it. SITE Limited was allowed to manage its financial affairs without assistance from the government, or interference from the bureaucracy. SITE was assigned to establish other estates in Karachi, Hyderabad, Sukkur, Kotri, Nooriabad, Nawab Shah, Mirpurkhas, Khairpur, Tando Adam and other important towns. As a result, 24 large and small industrial complexes were established, but the infrastructure facilities were insufficient and substandard. Bureaucratic red-tape and later a poor law and order situation prevented these sites from developing optimally. Many of them have remained unoccupied and inactive over the last decade.

Inadequate infrastructure facilities have retarded industrial development in the province. The level of urbanisation in Sindh reflects this. The ratio of urban to rural population in the province is 49:51. When 30 percent of the population becomes urban it suggests a high threshold of economic development and over 45 percent suggests a take-off stage³. The ratio for Sindh suggests that the province is at an advanced stage of development which is not the case. The population of Karachi, Hyderabad, and Sukkur combined makes up for 73 percent of the urban population of Sindh. Moreover, Karachi is the primary city of the country and the main centre of commercial and industrial activity. It has a population that is twice as much as that of the rest of the urban population of Sindh, which goes to show that interventions aimed at the dispersal of industries throughout the province, were a failure.

Due to the reasons given above, domestic and foreign investment has not been forthcoming. The brain drain is a persistent problem as professionals and entrepreneurs move to foreign countries. Increasingly insecure capital is seeking investment abroad.

1. Agriculture Statistics of Pakistan, 1997-98; Agricultural Statistics of Pakistan 1992-93,1997-98; Development Statistics of Sindh, 1998
2. Beg, M.A.A. "The New Economic Order, Where do we Stand?" Sindh Tribune, Nov. 1995
3. Mumford,L. Natural History of Urbanization, in *The Ecology of Man: An Ecosystem Approach*, R.L. Smith, Harper and Row Publishers, New York, 1972

Public sector industries are being privatised under the Structural Adjustment Programme yet there has been very little direct foreign investment in industry. Information technology, oil and gas, food, tobacco and beverages, are the only components of the industrial sector that have received substantial (\$50 million USD each) investments. Massive devaluation has reduced the return in dollar terms, and enhanced the cost of plant, machinery and imported industrial raw materials.

Refer to Map 16.1 for the location of Industrial Estates in Sindh.

THE SERVICE INDUSTRY

The service industry is a key component of industrial infrastructure at the primary stages. It caters to the handling of agricultural products at farm level which includes threshing, storage, enhancing the shelf life of the products and freighting. This industry has remained disorganised and has yet to respond to the needs of the export market efficiently. This implies that an awareness of the export market requirements must be created among the growers, packers, and forwarding agents. In the absence of a suitable service industry, the economy has suffered because exported commodities do not conform to international standards.

All cash crops (fruits and vegetables, live animals, dairy products, and fisheries) and the minerals of Sindh are usually freighted to the nearest urban centre where they are processed on an industrial scale. Small scale processing industries (rice mills, flour mills, oil expeller units, power crushers for sugarcane at the farm level, ginneries) have been established in the undersized towns as well. Value addition to farm products at the small town level is picking up slowly with an improvement in infrastructure facilities. Establishment of large storage warehouses, cold storage houses and vegetable and fruits preservation units facilitate storage of perishable farm products during the glut period.

PACKAGING INDUSTRY

Over 90,000 tonnes of jute products are produced in three jute mills in the province. They provide the Hessian cloth and bags for packing wheat, rice, millets and other farm products. Production of cardboard and paper sacks required for packaging solids or powders such as cement is carried out in over 15 mills. Of the units manufacturing paper and pulp in Pakistan, 20 percent are located in Sindh⁴.

RICE AND FLOUR MILLS

Over 2 million tonnes of rice and an average of 2.3 million tonnes of wheat per year are produced in Sindh and generate considerable industrial activity. Paddy is dehulled and polished in about 1,200 rice mills (250 in Larkana, over 700 in Upper Sindh and 250 in the rest of the province). Wheat and grain crops are ground in about 126 flour mills in Sindh⁵, out of which about 45 to 50 percent are roller flour mills. Approximately, 50 to 55 percent of the flour mills are small scale grinders called *chakki* that are spread throughout the province and are found in practically all villages.

Straw from rice, wheat, and other grain crops is shredded mechanically and utilised as livestock feed. Rice husk is burnt on the field to drive away insects that lay their eggs in the soil. It is also used as fuel in brick kilns near the rice growing areas.

FARM PRODUCTS

Around 510,000 tonnes of fruit is grown in Sindh. These include mango, banana, guava, dates, and citrus fruits. Sindh cultivates onions, chillies, and tomato which are 40 percent, 81 percent, and 35 percent respectively of the total production in Pakistan. Fruits and vegetables are canned and preserved in seven medium-sized units and scores of smaller ones have mushroomed at the cold storage warehouses

4. Summary Release of Census of Manufacturing Industries 1995-96, Bureau of Statistics, Planning and Development Department, Government of Sindh, 2001; Monthly Survey of Industrial Production & Employment in Sindh, June 2001
5. Development Statistics of Sindh, 1998; Summary Release of Census of Manufacturing Industries 1995-96, Bureau of Statistics, Planning and Development Department, Government of Sindh, 200; Monthly Survey of Industrial Production & Employment in Sindh, June 2001; Dawn October 26, 1999 and January 14, 2003

and near the fruit and vegetable markets⁶. These use metallic cans and plastic bottles for canning the produce. Packaging materials are being processed in units which import raw material for their production.

Onion, chillies, coriander, spices and fresh vegetables (particularly potato, cauliflower, cabbage, peas, radish and carrots) and fruits produced at the farm level have attained the status of important export commodities. They have to be adequately packed according to the requirement of the consignee in the destined country. Packaging and marketing of these products is not entirely in the informal sector but those in the organised sector are faced with tough competition from the small informal food production units.

VEGETABLE PRODUCTS

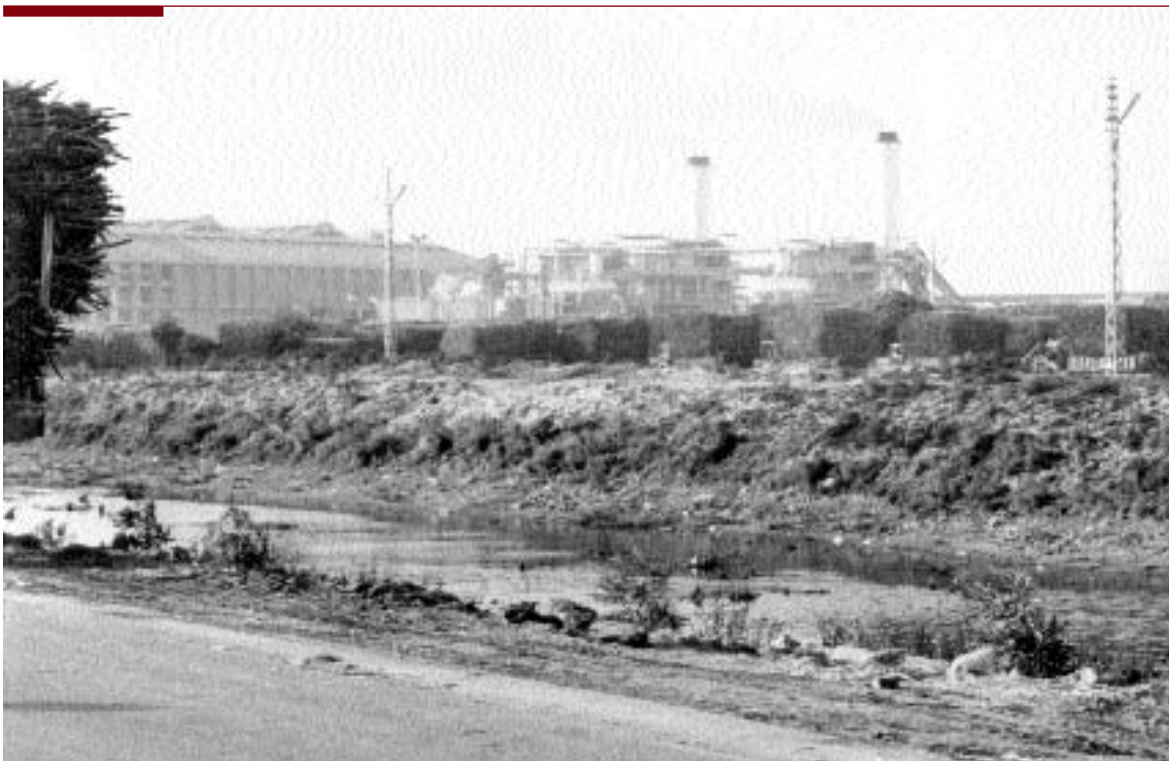
Vegetable produce related manufacturing industry in Sindh accounts for 158,253 tonnes, out of a total 734,518 tonnes produced in the country⁷. Many of these products are exported

but the associated packaging industry and forwarding needs improvement since mishandling of the crops accounts for 15 to 20 percent losses at the post-harvest stage. Further losses of over 10 to 15 percent occur as a result of lack of quality control and maintenance of standards in grading, preserving, storage and packing.

Livestock Products

Productivity in the livestock industry is low because the rangelands which provide 90 percent of the feed to animals have been degraded by overgrazing, cutting of forage for fuelwood, and low agricultural production, particularly during winter. Supplemental feed is exorbitantly expensive and has to be transported from different parts of Sindh through non-metalled roads to the range areas.

The livestock population of over ten million constitutes a valuable resource but, instead of exploiting this potential for value addition, the stock is dispatched as live animals to the



Ali Raza Rizvi

Sugar mill: An Agro-based industry

6. Ibid
7. Development Statistics of Sindh, 1998

Table 16.1: Manufacturing, industrial production and employment

Selected industries	Unit	Factories Covered	Production	Employment (in Nos.)
1998-99				
Vegetable <i>ghee</i>	"000" m. tonnes	23	191	1,673
Sugar	"000" m. tonnes	29	1,331	18,969
Cement	"000" m. tonnes	9	1,945	2,715
Fertilizer (Urea)	"000" m. tonnes	2	1,397	1,401
Cotton yarn	"000" m. tonnes	81	210	35,392
Cotton cloth	million sq. mtrs.		85	
Cigarettes	million. nos.	2	10,527	875
1999-2000				
Vegetable <i>ghee</i>	"000" m. tonnes	23	187	1,607
Sugar	"000" m. tonnes	29	959	16,022
Cement	"000" m. tonnes	9	1,915	2,520
Fertilizer (Urea)	"000" m. tonnes	2	1,423	1,391
Cotton yarn	"000" m. tonnes	81	232	36,548
Cotton cloth	million. sq. mtrs.		93	
CIGARETTES	million. nos.	2	10,980	824
Index of industrial production, 1999-2000 (Base : 1980-81 = 100)				170.37

Source: Monthly Survey of Industrial Production & Employment in Sindh, June 2001

nearest market. It is estimated that around 350,000 animals reach Karachi from different parts of the country during the first ten days of *Eid-ul-Azha*. The province does not have a regular slaughterhouse in any urban centre for the hygienic production of a range of animal products. About 1.3 million animals are slaughtered in improvised slaughterhouses in Sindh every year⁸.

Sindh has a large number of tanneries that process raw hides and skins and produce leather goods for the local as well as the export market. It has four mills that produce poultry feed for the local industry. There are five bone mills that operate under substandard conditions but provide material for organic fertiliser that is exported and raw material for the local production of gelatine.

DAIRY INDUSTRY

The dairy industry is not well organised, although 32 million tonnes of milk is produced in the province every year⁹. This can meet the need of the population of the entire province, yet per capita availability is low. The production system is in the informal sector and its development along modern lines has often been resisted. The alternatives in the form of milk plants have not solved the problems faced by this sector.

POULTRY INDUSTRY

Raw material for poultry feed is provided by the agriculture sector, and the feed as well as the

8. Development Statistics of Sindh, 1998; Monthly Survey of Industrial Production & Employment in Sindh, June 2001; Dr Aslam Pervez Umrani, Livestock Census and Role of livestock production in economy - Dawn (EBR section), 21 February, 2000

9. Ibid

poultry products need to be processed. However, it has not attained the status of a modern consumer products industry.

MEDIUM AND LARGE SCALE INDUSTRY

Cotton is one of the major fibre crops of Sindh, which produces over 2.3 million bales each year. The industries dependent on this crop are ginning, pressing and textile processing. There are 154 ginning, pressing and baling mills in Sindh. Around 2.1 million bales were pressed in the year 2000. Ginning separates the lint from cottonseed, which is used by the oil mills for the production of cottonseed oil and also hydrogenated *ghee*. Textile processing is one of the major industrial activities in Sindh. Out of a total of 650 textile processing units in Pakistan, 350 are located in the province. These units are involved in every nature of textile activity including 95 units that are engaged in the production of ready made garments¹⁰.

Out of the 77 sugar mills in Pakistan, which produce over 4.2 million tonnes of refined sugar annually, 32 are located in Sindh¹¹. Molasses is also extracted in the sugar mills and from it alcohol is produced. Sindh has only two of the nine sugar mills in Pakistan that use molasses to produce alcohol, which is exported. The sugar industry in Sindh is plagued by many problems. On the one hand is the high price of sugarcane, and on the other hand heavy taxes on the industry and exorbitant bank charges.

The sugar industry in Sindh is one of the most organised sectors in its institutional arrangements. Some of the reasons for the multiplication in the number of sugar mills are grants of continuous incentives by the government, establishment of local technology vendors (heavy mechanical complex in Taxila), commitment and hard work of mill owners, and employees, and the progressive roles of the

Pakistan Society of Sugar Technologists (PSST), and the Pakistan Sugar Mills Association (PSMA) which provide a forum to sugar technologists and mill owners to discuss and share indigenous and international technological developments in this sector.

VEGETABLE OIL AND GHEE

Vegetable oil and *ghee* processing is categorized under food manufacturing. Rape and mustard seed, groundnuts, sesame, sunflower and some coconut is pressed in the small expellers in urban centres to meet the local need for edible oil. Cotton seed produced during ginning is pressed at 14 cottonseed oil mills. There are 3 that produce only vegetable oil and 15 medium-sized mills that produce hydrogenated oils, or vegetable *ghee*. These medium-sized units have integrated facilities for manufacturing soap as a by-product whereas the main raw material used is raw oil extracted from different oilseeds. Pakistan imports about 1 million tonnes of edible oil, mostly from Malaysia. About 700,000 to 900,000 tonnes is produced locally, of which Sindh has a share of around 35 percent. The vegetable oil units were, in the year 2000-2001, producing an average of 17,000 tonnes vegetable *ghee*, 7,500 tonnes of non-hydrogenated cooking oil, and 48 tonnes of soap. The animal feed producers utilise the oilseed cake as a source of fibre, oil and protein¹².

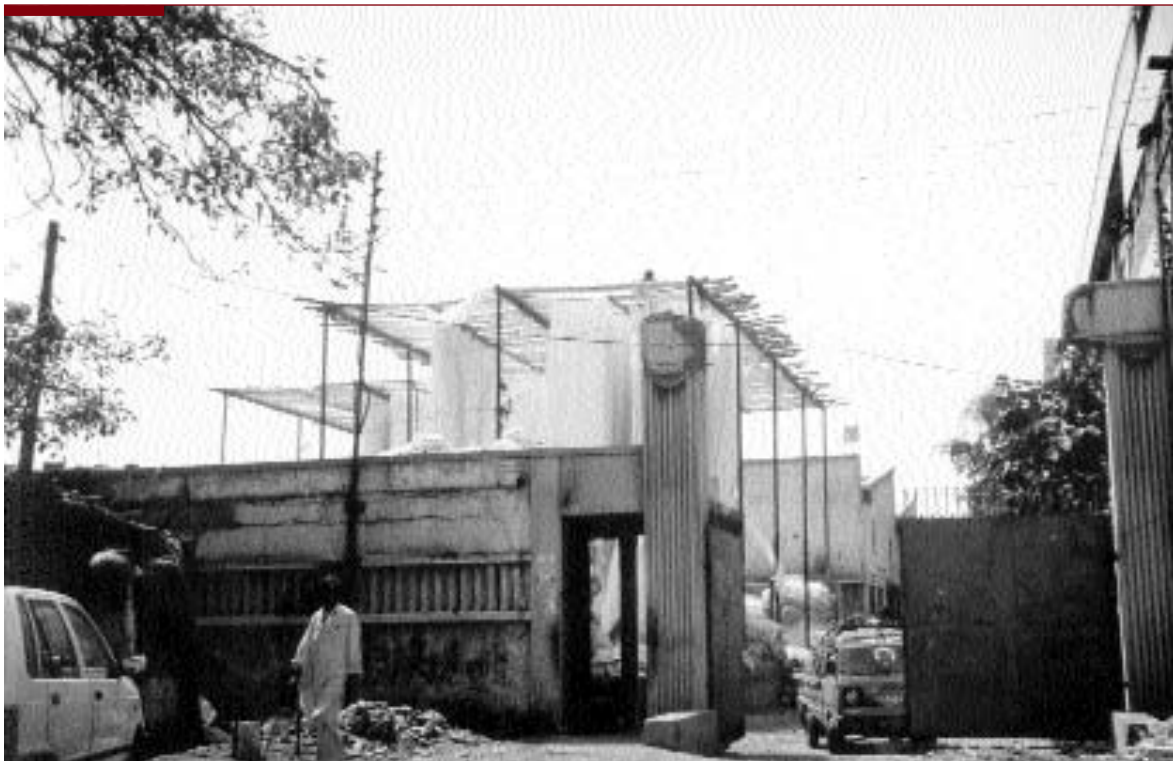
TANNING INDUSTRY

The tanning industry is an offshoot of the livestock sector and of the slaughter houses in the province. Presently, there are over 596 tanneries in the formal sector in Pakistan and an equally large number in the informal sector. Of these, 170 are in Karachi while the other urban centres of the province are processing

10. Development Statistics of Sindh, 1998; Summary Release of Census of Manufacturing Industries 1995-96, Bureau of Statistics, Planning and Development Department, Government of Sindh, 2001; Monthly Survey of Industrial Production & Employment in Sindh, June 2001

11. Ibid

12. Agricultural Statistics of Pakistan 1992-93, 1997-98; Development Statistics of Sindh, 1998; Summary Release of Census of Manufacturing Industries 1995-96, Bureau of Statistics, Planning and Development Department, Government of Sindh, 2001; Monthly Survey of Industrial Production & Employment in Sindh, June 2001



A Textile factory: Out of 650 textile processing units in Pakistan, 350 are located in Sindh

leather in the informal sector. For leather production, locally available raw materials like hides, skins and imported processing chemicals, are used. The production of leather was 9.2 million m² during the year 2000-2001 with seven recognised footwear industries in Sindh. Another major product of the livestock sector is wool for which there are nine woollen mills engaged in spinning, weaving, and finishing while the same numbers of units are engaged in carpet and rugs manufacture¹³. All of these are in the formal sector. A flourishing informal sector in carpet and rugs manufacture also exists.

PHARMACEUTICALS

There are 43 pharmaceutical manufacturing units in Sindh which use imported pharmaceutical raw material and patented/proprietary medicine, convert it into the desired form like tablets, liquid syrup, injection or capsules and market them in attractive packaging. Indigenous raw material

and intermediates have not found any application in the established pharmaceutical factories. There are three units producing acids, alkalis, and salts, and eight units producing paints and varnishes. There are also 32 units producing miscellaneous plastics products¹⁴.

MINERAL-BASED INDUSTRY

The mineral sector does not contribute significantly to the industrialisation of the province. A number of commercially exploitable minerals like coal, natural gas, marble, dolomite, and china clay, have now found industrial use but, until the 1960s, only limestone, clay, silica sand and gravel were being used and that too for the production of cement, glassware and as building material. The present contribution of the mining sector to the GDP is less than one percent, out of which oil and natural gas has a major share.

13. Ibid

14. Ibid

CEMENT

There are nine cement manufacturing units in Sindh that are, at present, producing an average of 150,000 tonnes of cement per month¹⁵. The cement industry is deteriorating below par due to the excessively high price of furnace oil and the increased cost of power. These costs can be reduced substantially through the use of coal. Coal was being used in this industry as fuel but a switchover to gas as a clean and easily available fuel sidelined its use.

SALT

Salt works on the coast of Karachi were catering to the requirements of all of Sindh until the late 1960s, but discharge of municipal and industrial effluent into the two dry rivers, Lyari and Malir, contaminated the coastal waters and the production of salt thereby declined. Six of the 12 salt works have had to close down because of these difficulties and also because one of their major clients producing soda ash (a requirement for salt extraction), in Karachi, was forced to close down as a result of financial and managerial constraints¹⁶. The demand-supply gap has been filled by salt from the Salt Range in the Punjab.

COAL

Coal could contribute substantially to the power sector but, unfortunately, is not being utilised for that purpose. The Jamshoro Power Plant, despite using poor quality coal from Lakhra coal mines, has demonstrated its utility and efficiency. Tharparkar coal is mostly lignite (which means it has a lot of moisture) but the deposits are the largest in the world with a net reserve of 185 billion tonnes. A coal deposit of 300 million tonnes is a viable source of 1000 megawatts for 30 years¹⁷.

CHINA CLAY

Even though Nagarparkar clay is of superior quality it has not been utilized effectively for the manufacture of chinaware for the local or the export market. There are four units in Sindh producing chinaware and ceramics; 15 units producing glassware, and one producing sheet glass¹⁸. Many of these units have foreign franchises and hence use local products only when they conform exactly to their requirements, otherwise they prefer to import the material. China clay from Nagarparkar can be upgraded to the required level but this is not allowed by the foreign franchise.

OIL AND GAS DEPOSITS

Details regarding oil and gas deposits have been given in Chapter - 17: Energy Resources of Sindh. In addition, the province has deposits of gas at Mazarani. Extraction from the wells is likely to commence in about two years. There are also wells which have, due to the presence of 10 percent excess carbon dioxide, proved very useful in the production of fertiliser at two fertiliser factories in Upper Sindh. These two units produced 1.387 million tonnes urea and 800,000 tonnes ammonia in the year 2000-2001¹⁹. Yet another unit produces phosphate fertilisers for which phosphate rock is being imported from Jordan.

There are also wells which have, due to the presence of excess carbon dioxide in ten percent of them, proved very useful in the production of fertiliser at two fertiliser factories in Upper Sindh.

PAKISTAN STEEL MILLS

Pakistan Steel Mills started operating in 1984, based on imported coal and imported iron ore. It produced 700,000 tonnes coke, 1.021 million

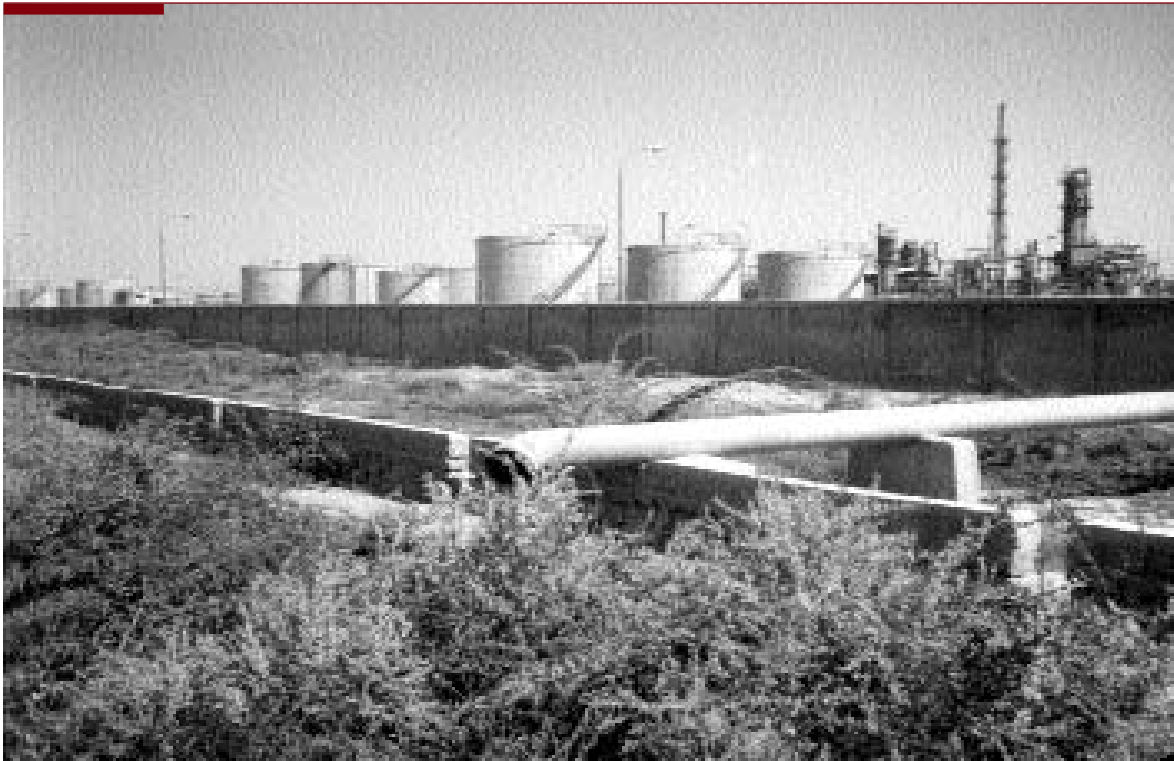
15. Ibid

16. Beg, M.A.A, Mahmood, S.N. and Yousufzai A.H.K, 1979. Effect of the Polluted Lyari on the Coastal Environment, Proc. National and Regional Seminar for the Protection of the Marine Environment and Related Eco?Systems, (Karachi, 1979)

17. Beg, M.A.A. "Energy Production in Pakistan" Dawn (EBR section), February 2001; Pakistan Energy Yearbook, 2000, Hydrocarbon Development Institute of Pakistan, January 2001

18. Development Statistics of Sindh, 1998; Summary Release of Census of Manufacturing Industries 1995-96, Bureau of Statistics, Planning and Development Department, Government of Sindh, 2001; Monthly Survey of Industrial Production & Employment in Sindh, June 2001

19. Development Statistics of Sindh, 1998; Summary Release of Census of Manufacturing Industries 1995-96, Bureau of Statistics, Planning and Development Department, Government of Sindh, 2001; Monthly Survey of Industrial Production & Employment in Sindh, June 2001



Refinery in Korangi Industrial Area, Karachi

tonnes pig iron, 400,000 ton billets, and 941,000 tonnes raw steel in the year 2000-2001²⁰.

AUTOMOBILES

There are 13 plants engaged in the assembly of automobiles. In the year 2000-2001, they produced 409 trucks, 555 buses, 471 heavy vehicles, 9584 light vehicles, 40,267 motorcycles and 33,397 cars²¹.

EFFECTS OF INDUSTRIAL UNITS ON THE ENVIRONMENT

Emissions and Discharges

The units operating in the industrial estates adequately control emission of noise and the

level recorded at the boundary walls of such units has not been found to exceed 75 db (A) during daytime and 70 db (A) during the night²². In the NEQS, the limit of noise is given as 85db.

Emission of gaseous pollutants from almost all the industrial units is not physically controlled; it remains within allowable limits, except in a few cases like the unit producing ultramarine blue in Korangi Industrial Area. The impact of these pollutants on the ambient air is low.

There is discharge of aqueous effluents from factories in almost all the units in the SITE whose quantities by far exceed allowable limits²³. This is especially true of the textile, tanning and chemical processing industries. The effluents are discharged into the nearest *nala*, which ultimately falls into a river, stream or the sea or into large ponds. The impact of uncontrolled discharges on the environment is destructive. The discharge of effluent from

20. Ibid

21. Ibid

22. Beg, M.A.A. "Status of Noise pollution in Karachi" Report Submitted to EPA by Associated Consulting Engineers, 1994; Beg, M.A.A and Shams, Z.I. *Environmental Problems of Karachi: Noise Pollution due to Vehicular Traffic*, 1988

23. Pakistan Energy Yearbook, 2000, Hydrocarbon Development Institute of Pakistan, 2001



An industrial complex in Karachi

SITE at Manghopir has polluted marine resources and the sea salt works along the coast²⁴.

Solid waste disposal from the industries is also degrading the environment since, in many cases, it is dumped outside the factory premises, especially in the case of sugar and ceramic industries, or is burnt along with other solid wastes in an incinerator on the factory premises²⁵. However, hazardous waste is being disposed off in Karachi by a few pharmaceuticals and pesticide formulation units in appropriately designed incinerators of their own or in commercial incinerators.

Refer to Map 16.2 for Formal and Informal Industrial Activity in Karachi.

CAUSES FOR THE PRESENT SITUATION

Industrialisation was not per se a Sindh issue because it was the federal government that developed the policy and implementation procedures²⁶. The province contributed by making available entrepreneurship, technical expertise and some elements of infrastructure.

Industrialisation has had to face many challenges, including the importation of smuggled goods from other provinces, the production of low quality products by an increasingly aggressive informal sector and the growth of the underground economy. It has also suffered from ill planned government policies that offered incentives, concessions and

24. Beg, M.A.A, Mahmood, S.N. and Yousufzai, A.H.K. "Effect of the Polluted Lyari on the Coastal Environment, National and Regional Seminar for the Protection of the Marine Environment and Related Ecosystems" 1979; Beg, M.A.A, Mahmood, S.N. and Yousufzai, A.H.K. "Industrial Effluents, their Nature and Disposal in Karachi Region: The Polluted Streams of Sindh Industrial Trading Estate, Manghopir" 1978; "Heavy Metal Pollution in the Coastal Environment of Karachi", Pakistan Journal of Marine Sciences, 1992
 25. Beg, M.A.A. on the Status of Solid Waste Problem in Pakistan and solutions, National Seminar on Solid and Hospital Waste, Organized by Sindh Ombudsman Secretariat, 2002
 26. Beg, M.A.A. "Performance of Manufacturing Sector in Pakistan", Chapter IX, *Democracy Displaced in Pakistan, Case History of Disasters of Social Pollution*, Research & Development Publications, Karachi, 1998
- Ghausi, S. "Industrialization Slows Down in Sindh" *Dawn* (EBR section), December 22, 2001

subsidies to disburse the industries in remote, rural areas in order to promote development.

The other major issue was the inadequate infrastructure provided by the federal government²⁷. An optimally functioning steel mill and engineering industry is imperative for the development of technology to fabricate plants and equipment for processing material if the conventional system of industrial expansion is to be adopted as the route to growth. Environmental protection and pollution control should have become major issues as soon as they were identified and their negative impact was acknowledged.

The natural place for the establishment of industrial zones was Karachi and Hyderabad because of the availability of infrastructure, entrepreneurship and professional expertise. However, a ban on setting up industry in these cities was imposed and industrial estates were created in the smaller towns. This policy failed since the smaller towns did not have the infrastructure or resources to cater to industrialisation, leading to a surge of growth of the informal sector in Karachi.

Sustainable development strategies demand that provincial and local governments should be involved in promoting industrial units that are related to the local ecology such as consumer items and agro-based industries. The nature of

industrialisation that was encouraged required large financial inputs which were not available. Such being the case, foreign capital in the form of loans had to be sought and this has contributed to the unsustainable nature of industrialisation in Sindh²⁸.

EMERGING TRENDS

The export of manufactured goods as a means of reducing the Balance of Payments gap was effective only during the early years after independence (1951-55), when it accounted for 96.9 percent growth of the industrial sector. This is apparent from Table 16.2 where data for over 60 percent industries in Sindh is given²⁹.

Import substitution and Export expansion promoted by the state did not lead to the growth of the industrial sector. Since the province had no capacity to build capital and intermediary goods they had to import them to keep industrial units running. A steel mill and a sound engineering base were not in place. This was because industrialisation and the proposed setting up of a steel mill was a federal subject and Sindh's priorities were not taken into consideration. The result was that the share of industries based on indigenous materials gradually fell from 71 percent in 1954, to 58.7 percent in 1990. This fall was due to many reasons, including the enhanced rate of capital

Table 16.2: Share of Domestic Demand, Export Expansion and Import Substitution in Economic Growth

Period	Domestic Demand (Percent)	Export Expansion (Percent)	Import Substitution (Percent)
1951-55	2.4	1.8	96.6
1955-60	53.1	24.6	22.9
1960-64	95.7	4.6	-0.3
1964-71	66	15.0	25.0
1981-89	79.7	10.2	10.1
1989-92	37.4	37.9	1.7

Source: Competitiveness of Pakistan in Export, Ijaz Nabi in 50 Years of Pakistan Economy, edited by Shahrukh Rafi Khan, Oxford University Press, Karachi, 1998

27. Beg, M.A.A. "Technology Development: Strategy for Self-reliance", *Pakistan Business Report*, April 1991

28. Beg, M.A.A. "Performance of Manufacturing Sector in Pakistan" Chapter IX, *Democracy Displaced in Pakistan, Case History of Disasters of Social Pollution*, Research & Development Publications, Karachi, 1998

29. Nabi, Ijaz. "Competitiveness of Pakistan in Export", in 50 Years of Pakistan Economy, ed; Shahrukh Rafi Khan, Oxford University Press, Karachi, 1998

30. Ibid

utilisation, which led to higher output of import-intensive industries³⁰.

The late 1980s and mid 1990s, provided an opportunity to re-orient the import substitution-export expansion policy and to opt for sustainable development. When this did not happen, entrepreneurs resigned themselves to working with bare minimum facilities and poor infrastructure. In the process, important issues related to conservation practices, pollution control, waste minimisation and social issues were ignored. This increased the BoP gap and the pace of de-industrialisation³¹.

Environmental protection and pollution control became a major issue by the late 1980s. Surveys of the quality of industrial wastewater, gaseous emissions and solid wastes discharged into the environment clearly indicated that the industries had to make use of pollution control technologies to maintain some sense of balance in the environment³². The Chambers of Industries and Commerce sidelined this issue on the grounds that the price of treatment was high and would raise the cost of production, affecting output, which was already uncompetitive.

In the informal sector small scale manufacturing based on indigenous or indigenised technologies producing consumer products persist as the main contributor to economic development. The rate of growth of large scale manufacture declined from 15.4 percent in the 1950s to 3.39 percent during and after the 1970s³³. In the 1960s the rate of growth of the informal sector was a mere 2.3 and 2.9 percent, respectively, however, in the 1970s it increased

to 8 percent. This sector accounts for 50 percent of the industrial production in Sindh³⁴.

The index of industrial production uses 1980-81 =100 as its base year. Output rose to 160 and remained so between 1989 and 1991; it increased to 170 in 1994-96, remaining static until 2002 after which it declined to about 130, indicating a slow down in industrial activity as well as deindustrialisation³⁵. Sindh had 39 percent of the total industrial capacity of the country in 1999 - 2000. It is now reduced to 34 percent, but still contributes 43 percent in large scale and 25 percent in small scale manufacturing³⁶.

Constrained by the unemployment of local manpower, educated or otherwise, it was made mandatory by the government for the local entrepreneurs to employ locals in different units, irrespective of their suitability for the position or its availability. This decision adversely impacted the performance of value adding units such as the Steel Mills. Many such units had to close down their operation at the Nooriabad Industrial Estates for this very reason.

The unstable security conditions in industrial locations further slowed down production. Only recently, rice mill owners have protested against the kidnapping and killing for ransom of family members and have threatened to close down all rice mills in Sindh³⁷.

There are other major problems which include the non-availability of credit, cash flow and foreign exchange. As a result, there is a lack of confidence in the investment market. The road

31. Ghausi, S. "Industrialization slows down in Sindh" *Dawn* (EBR section), December 22, 2001

32. Beg, M.A.A. "Status of Noise pollution in Karachi", Report Submitted to EPA by Associated Consulting Engineers, 1994; Beg, M.A.A and Shams, Z.I. "Environmental Problems of Karachi: Noise Pollution due to Vehicular Traffic" *Pakistan Journal of Science and Industries*, 1988; Beg, M.A.A. *Report on Status of Air Pollution in Karachi, Past, Present and Future*, World Health Organization, Eastern Mediterranean Region, Alexandria, 1991; Beg, M.A.A. *Status of Industrial Pollution in Pakistan*, IUCN Workshop on Development of Conservation Strategies for Pakistan, Islamabad, 1986; Beg, M.A.A, Mahmood, S.N. and Yousufzai, A.H.K., *Industrial Effluents, their Nature and Disposal in Karachi Region: The Polluted Streams of Sindh Industrial Trading Estate, Manghopir*, 1978; Beg, M.A.A, Mahmood, S.N. and Yousufzai, A.H.K., *Heavy Metal Pollution in the Coastal Environment of Karachi*, *Pakistan Journal of Marine Sciences*, 1992; Beg, M.A.A, on the Status of Solid Waste Problem in Pakistan and solutions, in a seminar on Solid and Hospital Waste, Organized by Sindh Ombudsman Secretariat, 2002

33. Beg M.A.A, "Performance of Manufacturing Sector in Pakistan". Chapter IX in *Democracy Displaced in Pakistan, Case History of Disasters of Social Pollution*, Research & Development Publications, Karachi, 1998

34. Ibid

35. Beg, M.A.A. "Performance of Manufacturing Sector in Pakistan". Chapter IX in *Democracy Displaced in Pakistan, Case History of Disasters of Social Pollution*, Research & Development Publications, Karachi, 1998; Beg, M.A.A. "The New Economic Order, Where do we Stand?" *Sindh Tribune*, 1995; Ghausi, S. "Industrialization slows down in Sindh". *Dawn* (EBR section) December, 2001; Development Statistics of Sindh, 1998

36. Jamal, Nasir. 'Consumer durables industry gets boost', *Dawn* (EBR section), September, 2002; Statistical Pocketbook of Pakistan. 1999. Federal Bureau of Statistics. Government of Pakistan

37. *Dawn*, October 26, 1999; January 14, 2003

density in Sindh is poorer (0.17 km/km²) than the national average (0.20 km/km²) and is therefore inadequate to provide transportation of farm produce to industrial units or to facilitate the transportation of minerals from their sites to the processing destinations³⁸. Non-availability of water is also a major constraint because of bad water management and decline in Sindh's share of Indus waters³⁹. Groundwater is also under serious stress due to excessive extraction, bad management, and the failure to contain water run-off, which could recharge the aquifers. All these constraints have raised the cost of production due to which Pakistani products have become uncompetitive in the local as well as in global markets. The promotion of smuggling and dumping has also resulted in the closure of a number of industrial units which include Kohinoor Mercantile Industry, Pakistan Batteries, Green Ball Bearing, and RCD Ball Bearing which were successful units in the 1970s and 1980s⁴⁰.

STAKEHOLDERS

There are a large number of stakeholders in provincial industry since it cuts across many sectors, both national (federal, provincial and district level) and international.

Federal Government

The federal government is responsible for framing industrialization policies and also the fiscal, developmental (physical and social infrastructure), trade and commerce and environmental policies which are related to it. The federal government is also in charge of the development of major infrastructure such as highways, electricity and gas.

Government of Sindh

The Government of Sindh is responsible for setting up industrial estates, developing and

maintaining certain components of physical and social infrastructure, for instance, the maintenance of law and order.

Industrial Estates

The industrial estates are also stakeholders. They are required to protect the environment and to oversee the safe disposal of effluents, something they are not doing at present.

Environmental Protection Agency

The Environmental Protection Agency (EPA) Sindh is responsible for overseeing the process of industrialisation from the stance of controlling pollution and protecting the environment. It seeks to implement and monitor the NEQS. The EPA needs to ensure that the industrial units give their effluent appropriate treatment and also get industrial estates to provide combined effluent treatment facilities so that the units discharging small volumes do not have to make large investments towards pollution control.

Industrial Entrepreneurs

Industrial entrepreneurs have invested heavily in Sindh and require a political climate which promotes industrialisation and is able to provide them with security. Absence of the rule of law, job opportunities and effective recourse to courts of justice has caused unprecedented flight of capital and the professionals required for industrial enterprises. Rates of return on investment are steadily declining due to the increasing cost of utilities and heavy taxation imposed as a result of structural adjustments demanded by the IMF.

38. Development Statistics of Sindh, 1998

39. Beg, M.A.A, "Performance of Manufacturing Sector in Pakistan." Chaper IX in Democracy Displaced in Pakistan, Case History of Disasters of Social Pollution, Research & Development Publications, Karachi, 1998, Development Statistics of Sindh, 1998; Summary Release of Census of Manufacturing Industries 1995-96, Bureau of Statistics, Planning and Development Department, Government of Sindh, 2001

40. Almas, Zafar-ul-Hassan. "Slowdown in Manufacturing Sector" Dawn, February, 18, 2002; Suboohi, A. "Engine That is too Weak to Pull" Dawn (EBR Section), January 21, 2002

Manufacturing Sector

The manufacturing sector is one of the main stakeholders. Smuggled imported goods, tariff rates, and lower quality products provided through the informal sector challenge it. The border police and customs officials are also stakeholders because they promote smuggling by receiving bribes from the underground economy.

Small Investors in the Informal Sector

Small investors in the informal sector have the capital and know-how for production but they are not recognised by the State. Their businesses are located in unauthorised sites and many of them are not under the tax net of the government, using domestic utilities for commercial production.

Other Stakeholders

There are a number of other stakeholders as well, such as manufacturers in small industries, the Export Promotion Bureau, labour unions, voluntary organisations of the *arhi* and *baypari*, and academic institutions that train personnel in the disciplines required for the development, administration and management of the industrial sector.

FUTURE ACTION

Future action includes: the need for identifying locations for units that have adequate provision of industrial infrastructure including maintenance facilities; making sure that the policies are forward looking; consolidating the gains of industrialisation in production of consumer goods; attending to the brick-and-mortar technologies that weave in the product of one with the input of the other; launching a broad based programme for making the process self-reliant; arresting the irritants that are responsible for the slow down in industrialisation and environmental pollution and attending to deficiencies.

Faulty federal government policies account for the deterioration of industrial production. Revenue collected from the industries established in the province is not ploughed back into upgrading the infrastructure of the industry or the industrial estate concerned, which is why it is in shambles. It is necessary for the industrial estates to be financially autonomous so that they have the authority to repair and maintain not only the physical but also the industrial infrastructure.

The role of the informal sector needs to be recognised, particularly given that almost 50 percent of the industrial production emanates from there. This sector must be upgraded and allotted the status of a production system. Serious attempts should be made to relocate the productive units in planned estates and finance their advancement through small and medium enterprise development schemes.

Action also needs to be taken on improving the quality of Pakistani products and inducing local industrialists to patronise Pakistani machinery. The system of quality assurance through ISO certification should become mandatory for all units including those in the informal sector.

Industrial planning has been ad-hoc and inconsistent. To set things right, the province must initiate actions to devolve the power of governing the affairs of the industrial estate to either an autonomous industrial estate authority or an industrial estate association. The authority or association could be charged with the responsibility of upgrading its status and enlarging the scope of activity from a provider of physical infrastructure to one that provides a complete list of industrial infrastructure including pollution control. It should see to it that each component is adequately funded; and appoint a monitoring team to see to it that the funds are appropriately utilised for the intended purpose.

There is a good chance that by following this sequence, the industrial estates may provide the investor with the much needed one-window operation.

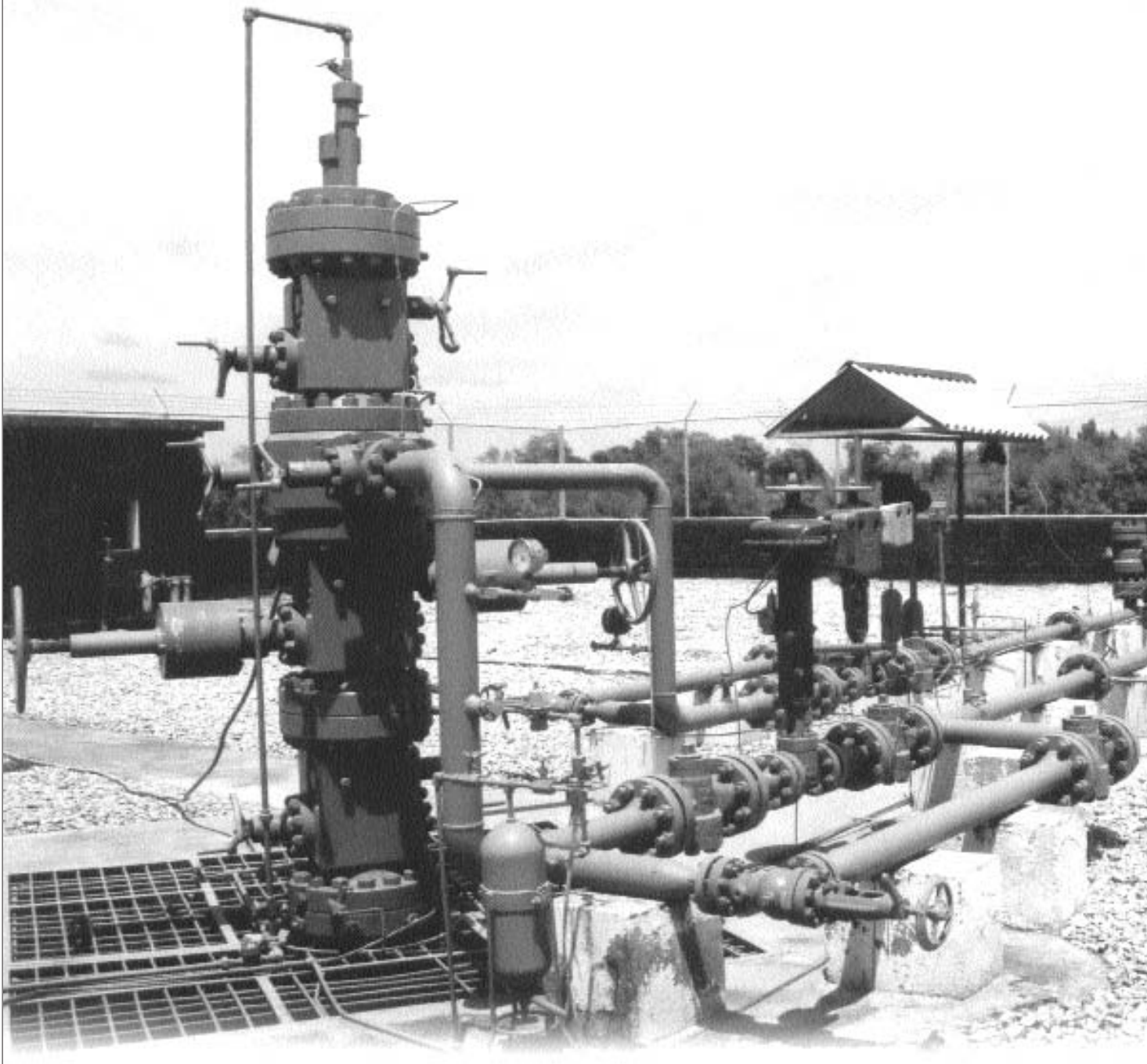
Sindh has the steel mill but it does not process indigenous ore or coal. Iron ore of good quality is available in Balochistan, while plenty of coal

is available in Sindh. The development of the technology for utilising these indigenous raw materials is imperative. A research and development base is already available with the Pakistan Steel Mill for initiating this process. If this happens, Sindh will become self-sufficient and will not have to rely on imported raw material.

An engineering base needs to be further developed so that machinery or spare parts can

be manufactured in Pakistan rather than imported from abroad. Strengthening the engineering base will also facilitate the local maintenance and operation requirements of machinery and save foreign exchange.

Finally, the EPA, Sindh should see to it that the industrial units abide by the Environmental Legislation 1997, and follow the NEQS. An efficient monitoring system for pollution control needs to be put into effect.



CHAPTER 17

Energy



The population of Sindh is widely distributed and the major population centres are along the Indus and the National Highway as shown in Map 17.1. The existing power distribution shown in Map 17.2 does not relate to this population pattern and is, therefore, incapable of meeting the energy needs of people living in remote locations.

The major portion of the monthly income in rural areas of the province is spent on food, leaving about five percent to fulfil the energy demands, resulting in low standards of living. Towns where facilities like electricity, roads, and other amenities are available fare better.

The roads network in Sindh is quite large but does not cover the entire area of the province as shown in Map 17.3, especially the remote areas. The absence of good roads is a hinderance to the development of energy infrastructure in Sindh.

Oil Reserves: Sindh has an abundance of oil, gas and coal reserves. The oil and gas reserves have been shown in Map 17.4. The quantum of oil reserves are given in **Appendix 17.1: Crude Oil Reserves as on June 30, 2001 (Million US Barrels)**.

Gas Reservoirs: Out of a total of 71 natural gas reservoirs, 55 (67 percent) are in Sindh having balance recoverable reserves of 15,951.8 billion cubic feet out of the Pakistan total of 24,043

billion cubic feet. Annual production is 875,433 million cubic feet with an annual cumulative growth rate of 6.6 percent¹. At this rate of consumption, natural gas is likely to be exhausted within two decades of this century. The prospects of gas imports from Turkmenistan are being explored and so is the possibility of a gas pipeline project linking Iran with India.

Coal Deposits: Sindh has the largest deposits of coal in the country and also one of the largest deposits in the world at Thar, which have still to be mined. Table 17.1 gives the details of coal reserves in the province.

ENERGY PRODUCTION

Oil and Gas exploration: There were 18 exploratory wells drilled in the year 2000-2001 in Pakistan, of which 14 were in Sindh. Another 31 appraisal wells were drilled in the same year, and out of these, 27 were in Sindh. This shows the potential of oil and gas in the province.

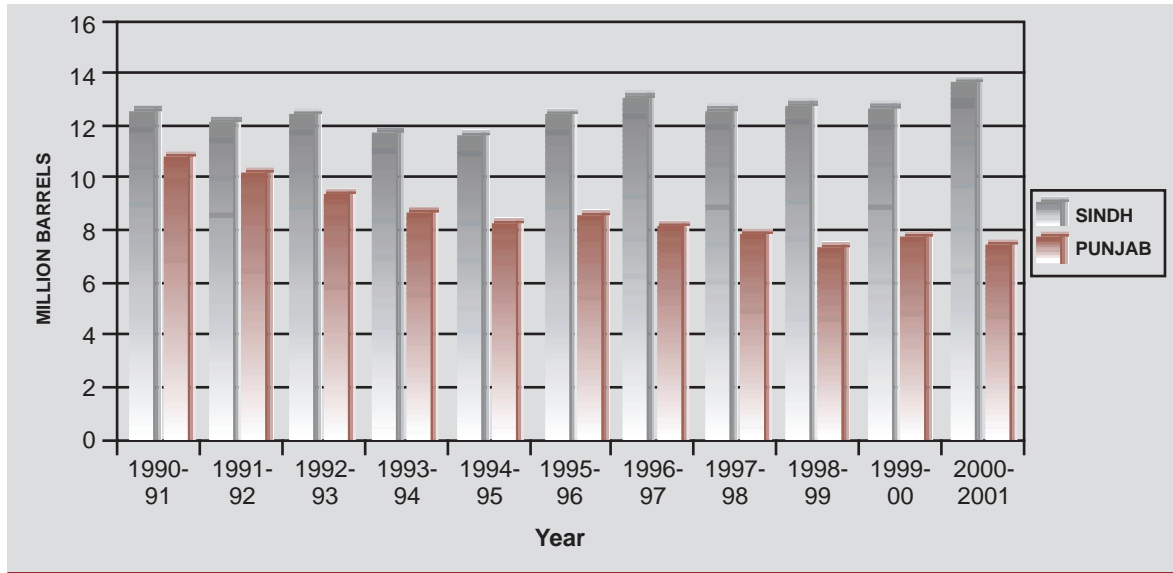
Table 17.1: Coal Reserves in Sindh (Million Tonnes)

Coal Field	Seam Thickness	Measured	Indicated	Inferred	Hypo- thetical	Total	Status	Heating value (Btu/lb)
Lakhra	0.3-3.3	244	629	455	-	1,328	Dev	4,622- 7,554
Sonda Thatta	0.3-1.5	60	511	2,197	932	3,700	Non-dev	6,762- 10,251
Jherruck	0.3-6.2	106	310	907	-	1,323	Non-dev	6,618- 11,029
Ongar	0.3-1.5	18	77	217	-	312	Non-dev	6,600- 9,618
Indus East	0.3-2.5	51	170	1556	-	1777	Non-dev	6,700- 7,500
Meting- Jhimpir	0.15-1.2	15	53	93	-	161	Dev	6,740- 7,460
Badin	0.55-3.1	3	13	-	-	16	Non-dev	9,823- 9,912
Thar Coal	0.25-12.58	3,752	10,627	81,153	79,974	175,506	Non-dev	6,223- 10,288
Total		4,249	12,390	86,578	80,906	184,123		

Source: Pakistan Energy Year Books, Hydro Carbon Development Institute, 1993-2001

1. Pakistan Energy Year Books, Hydro Carbon Development Institute, 1993-2001

Graph 17.1: Crude Oil Production in Pakistan



Source: Pakistan Energy Year Books, Hydro Carbon Development Institute, 1993-2001

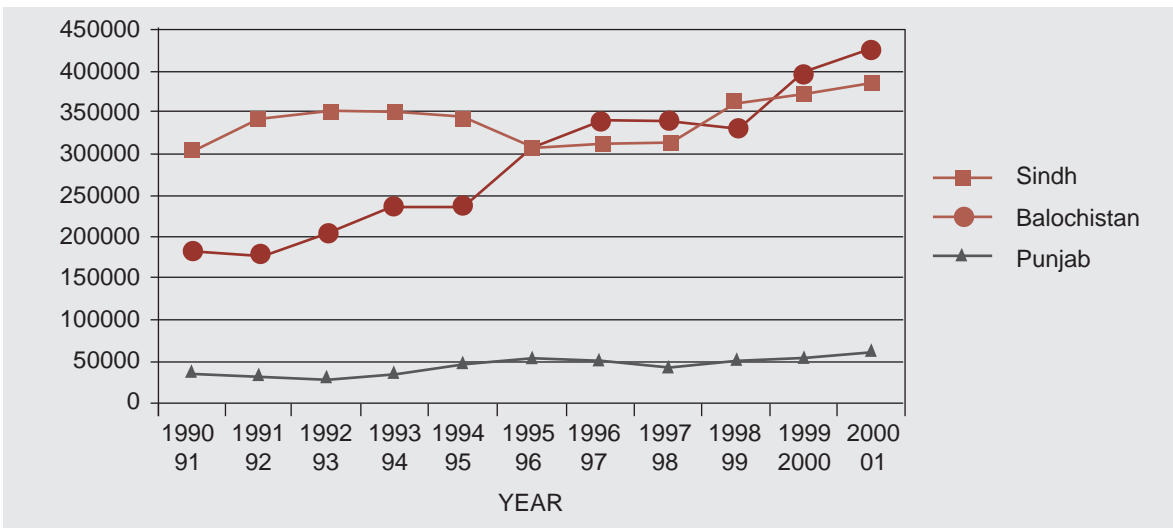
Eighty-four percent of activity in the oil and gas sector in terms of exploration is taking place in Sindh, which makes it the largest fossil fuel producer in Pakistan². Graph 17.1 shows that production in Sindh is gradually increasing whereas in the Punjab it is decreasing.

Sindh's output over the years is shown in Graph 17.2. This trend means that investment in this sector is being made in Sindh and therefore efforts must be made to provide jobs to the local population by providing them with adequate training in relevant disciplines.

Natural Gas: Sindh has replaced Balochistan as the major producer of gas. The increase in

Coal: Sindh has the largest deposits of coal in the country as well as one of the largest

Graph 17.2: Natural Gas Production in Pakistan Producers - 2001



Source: Pakistan Energy Year Books, Hydro Carbon Development Institute, 1993-2001

2. Pakistan Energy Year Books, Hydro Carbon Development Institute, 1993-2001 A

Table 17.2: Coal Production in Sindh (Million Tonnes)

Field	1995-96	1996-97	1997-98	1998-99	1999-2000	2000-2001	ACGR
Lakhra	1,241,965	1,217,207	1,154,329	1243743	972,498	970,738	-4.8%
Jhimpir	35,035	20,926	10,498	6,143	128,996	7,802	-25.9%
Total	1,277,000	1,238,133	1,164,827	1,249,886	985,394	978,540	-5.2%

Source: Pakistan Energy Year Books, Hydro Carbon Development Institute, 1993-2001

deposits in the world at Thar³. Despite this, coal production in Sindh has been decreasing since the last few years as shown in Table 17.2.

The private sector mines, comprising approximately 80 percent of the total mines in Sindh, lack capital resources and technical expertise. As a result, only 50-60 percent of the capacity of the mines is extracted.

The production of coal in Pakistan, in general, and Sindh, in particular, has been severely affected by the factors given below:

- The techniques of coal mining are primitive
- Miners are not adequately trained
- Coal mines are in isolated locations and hence power is not adequately available
- Production of coal was reduced due to the introduction of natural gas as an alternate fuel for production of power
- The quality of coal is poor

The consumption of coal in the power sector is adversely affected by the following major factors:

- Costly transportation from remote areas
- Ease of supply of gas to different localities through pipelines
- Low calorific values, deterioration during storage, high volatile matter
- Availability of cheaper petroleum (import and local production)
- Lack of incentives for production of coal

Coal utilisation in power production will remain a low priority in Pakistan due to the factors listed above. The energy infrastructure has been transformed to oil and gas technologies

and the reversion to coal can only take place through competitive pollution-free technologies. The discovery of very large deposits at Thar has created new opportunities for low cost recovery of coal and it is anticipated that the share of the resource in Pakistan's energy scenario will increase. Innovative indigenous efforts will be required to make the extraction and use of coal-based technologies cost effective.

Oil Refineries: Pakistan has five oil refineries of which the two older and larger ones are located in Sindh. The production of crude oil quantities from these refineries can be seen in Graph 17.3. Production from refineries in Sindh is continuously declining at an annual cumulative decrease of 3 percent.

The refineries in Sindh are outdated. The decline in their output can be attributed to the fact that the technologies employed have not been updated and the equipment has depreciated.

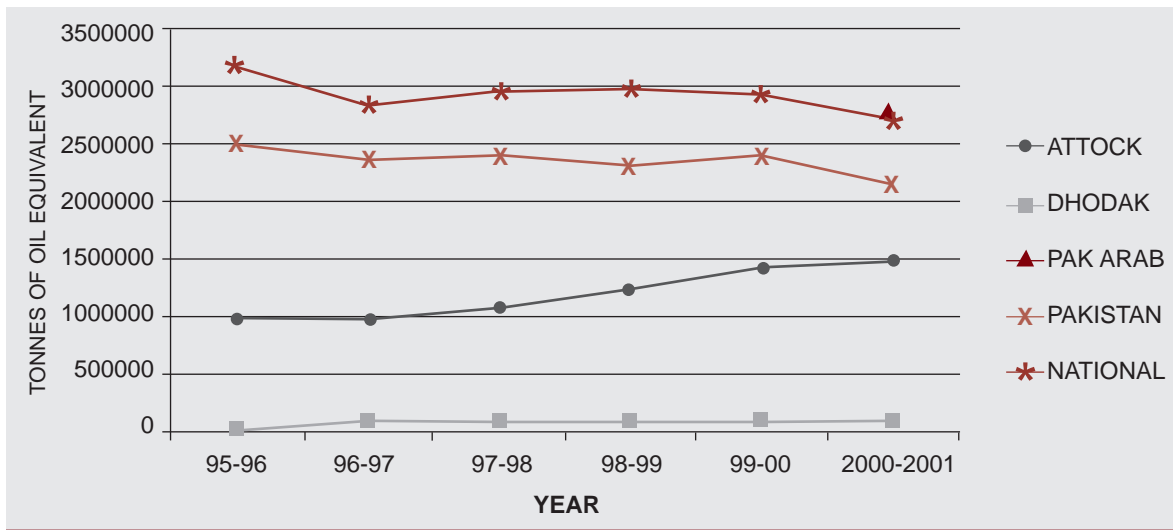
Electricity: While installed capacity for electricity generation in Sindh rose continuously to meet the demands of both urban as well as rural populations, its growth has stagnated significantly in the previous three years as seen in Graph 17.4.

Renewable Energy Resources: Renewable energy technologies have been experimented with in Sindh. Provision of electricity through solar energy was made at Angara and Dital Leghari villages but when WAPDA supplied these villages with electricity, the renewable energy installations became redundant.

Windmills for water pumping as shown in the photograph on the next page have also been

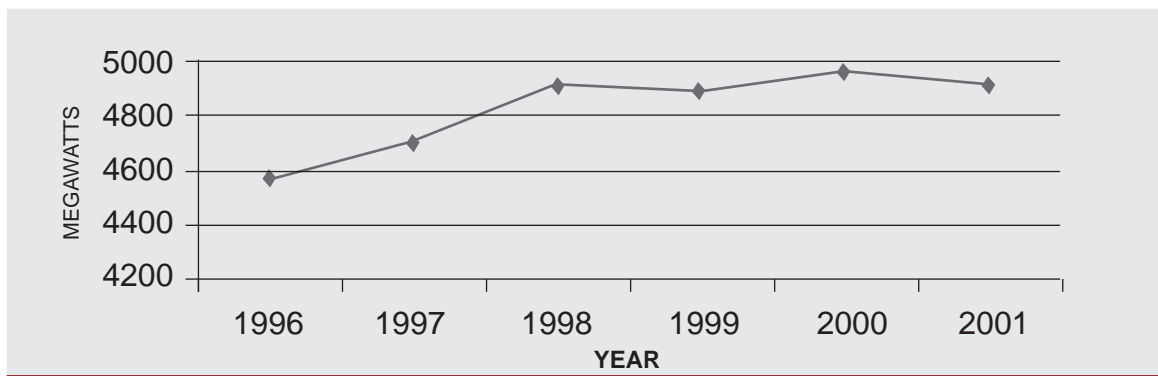
3. Ibid

Graph 17.3: Crude Oil Processed by Refineries in Pakistan



Source: Pakistan Energy Year Books, Hydro Carbon Development Institute, 1993-2001

Graph 17.4: Installed Capacity of Electric Generation in Sindh including Private Power Producers, 2001



Source: Pakistan Energy Year Books, Hydro Carbon Development Institute, 1993-2001

installed since 1980 at various locations. This technology was successful but the wells that were chosen started producing brackish water. This resulted in reduction of demand for this technology, although the defect was not technological in nature. In Balochistan, more than 225 wind pumps are operating in communities where there is no electricity and piped water⁴.

A large number of wind turbines were installed along the Karachi coast to evaluate the potential of wind energy in Pakistan. These are

now being used to provide streetlights to Defence Housing Authority, at SZABIST University campus at Gharo, and a model village established by Karachi University at Gharo.

Biogas is another technology that has been experimented with. Biogas plants have been installed in Mithi, Golarchi, Badin and Karachi and although their number is insignificant, communities in the area have readily accepted these technologies.

4. Khan Nasim A., Wind Mapping of Pakistan, Pakistan Council for Appropriate Technology, 2001

However, none of the renewal energy programmes have made a substantial addition to Sindh's energy resources.

ENERGY CONSUMPTION

Pakistan is amongst the lowest per capita energy consuming countries in the world. Annual energy consumption is 0.3 tonnes of oil equivalent (TOE), which is less than 3 percent of USA and 16 percent of the world average. The POL consumption is even lower in comparison with other countries and is 0.15 percent against 3.2 percent of the USA and 2 percent of Japan⁵.

Electricity consumption by different provinces is shown in Graph 17.5. It indicates that consumption of electricity in Sindh has been almost static over the past several years as compared to the Punjab.

Statistics for sectoral electricity consumption for the province illustrates that 42 percent of energy is consumed in the domestic sector and

35 percent by the industrial sector. This points to the underdevelopment of the province especially since it has the largest industrial sector in the country and two major ports. In addition, in the household sector, 72 percent of all energy is used for cooking and only 3 percent for lighting. Fifty two percent of energy used in the province is based on fuelwood, 17 percent on electricity, 8 percent on gas and 6 percent on kerosene. All these statistics point to a low level of infrastructural development.

POL consumption in Sindh is shown in Graph 17.6. It shows that power and transport are the major consumers of POL with a very small amount used by the agricultural sector. The increased utilization of POL in the transport and power sector is the major cause of air pollution in the province.

ISSUES AND TRENDS

Oil and Gas: Oil and gas reserves are being depleted rapidly. With the current rate of production, it is estimated that all indigenous oil reserves will gradually disappear in the first decade of this century, whilst the gas supply will hold out until the second decade. Efforts have to be made to diversify and use alternatives including the renewable source of solar energy. Given that the government spends USD 3.2 billion per year on the import of oil, which is a great burden on the economy, it should investigate the use of other alternatives.

Electricity: The energy consumption pattern in urban Sindh can be seen by the load profile of KESC as shown in Graph 17.7. The total power generation capacity of KESC is around 950 MW as shown by the lower line while the balance required is purchased from International Power Producers (IPP), KANUPP, or WAPDA at much higher rates. There is, therefore, a requirement to have power generation at lower costs.

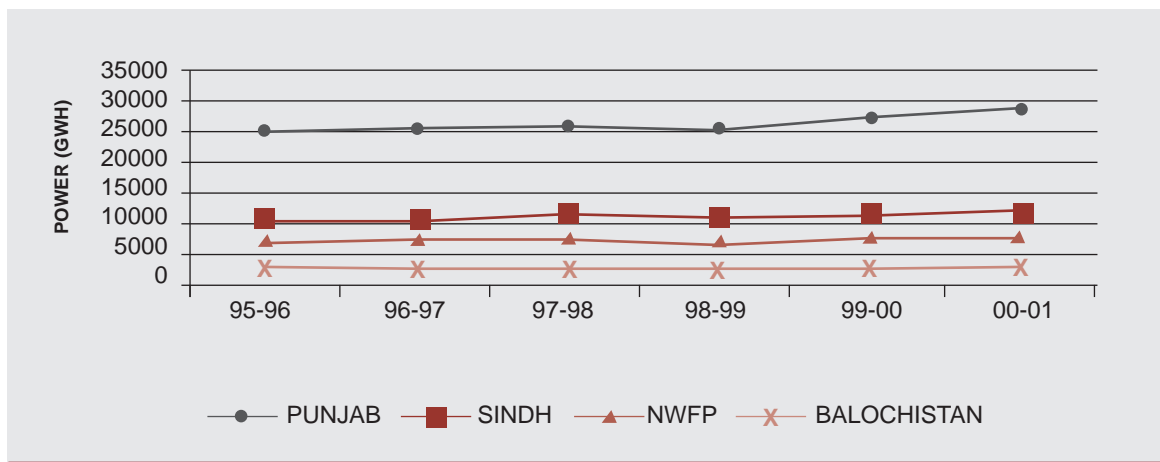
World Trend on Wind Energy: The global trend in the energy sector is to shift to the development and use of alternative renewable energy resources. Wind power generation has seen a growth rate of as much as 54 percent in



Wind pump installed near Gharo by Karachi University

5. Source: Khan Nasim A., Energy Resources and Utilization in Pakistan, College of EME, 2000

Graph 17.5: Electricity Consumption by Provinces



Source: Pakistan Energy Year Books, Hydro Carbon Development Institute, 1993-2001

some countries⁶. The coastal areas of Sindh are very windy and wind power can be used to meet the future demands of electrical energy at a lower cost and without the use of fossil fuel.

The best wind power generation sites in Pakistan are shown in Graph 17.8 and these include Chor, Badin, Karachi and Hyderabad in Sindh. Efforts must be made to capitalise on this resource. Maximum energy is required in summer and the graph shows that desirable output can be achieved in the summer months.

A 12-month wind mapping exercise has been done for Pakistan and the data for the month of May is shown in Map 17.5⁷. The area outside the yellow contour line of four meters per second is considered suitable for wind power generation. An extensive portion of the province therefore has suitable wind speed during summer months for energy production, which can be utilized for power generation as well as for water pumping.

Solar Option: Solar thermal power generation is utilized all over the world as are millions of solar geysers and cookers. Solar energy radiation data has been calculated, compiled and published for future consumers. A contour map of solar radiation for Pakistan for the month of July illustrates high values of solar

radiation in Sindh. Solar cookers, solar water heaters, wind water pumping and solar/wind desalination if made cost effective, can indirectly, help alleviate poverty in the province.

STAKEHOLDERS

There are several large government agencies managing different technologies needed in the field of energy and renewable energy technologies. These include the OGDC; PMDC; Geological Survey of Pakistan; WAPDA; KESC; PPIB; NEPRA; the Meteorological Department; Department of Mines and Mineral Development; Government of Sindh; Sindh Coal Authority; Geological Survey of Pakistan; private mine owners; mine labour organisations; environment groups and the media.

The organisations involved in research and development of Renewable Energy (RE), both in the government and the private sector are:

Solar Energy Research Centre Hyderabad (PCSIR)

This centre has been conducting R&D activities in low level solar thermal applications and has

6. Hans H. Landsberg, *Energy: The Next Twenty Years*, A Report of Study Group, Ballinger, 1979
Otfried Ischebeck (ed.) *From Fossil Fire to The Sun*, Akademischer Verlag Munchen, 1997

7. Khan, Nasim A., *Wind Mapping of Pakistan*, Pakistan Council for Appropriate Technology, 2001

successfully installed a few solar desalination plants.

Directorate of New and Renewable Energy, Ministry of Petroleum and Natural Resources

This department was responsible for constructing solar wind turbine villages and biogas plants. After establishing 18 such villages, the department was dissolved and the technology suffered a severe setback. These villages were then transferred to WAPDA.

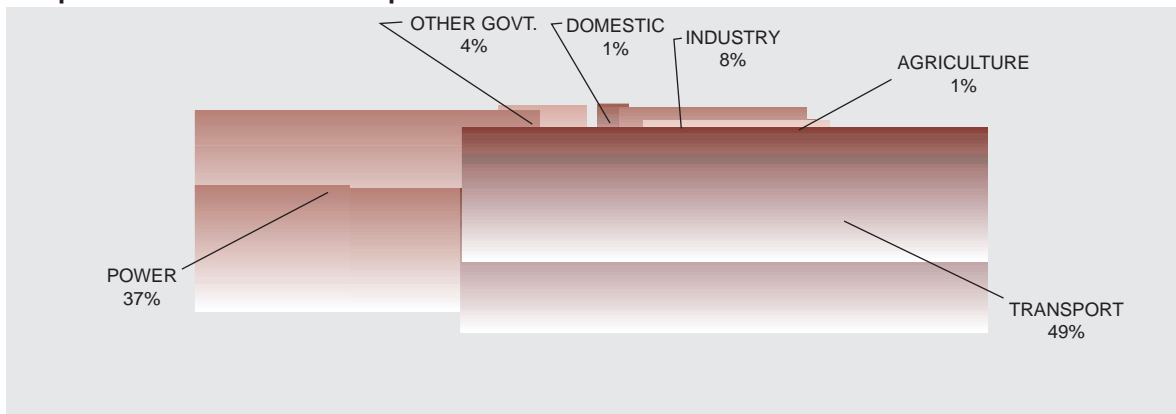
Pakistan Council for Appropriate Technology (PCAT)

PCAT was established to develop appropriate technologies and has now been merged with PCRET.

Directorate of Renewable Energy (WAPDA)

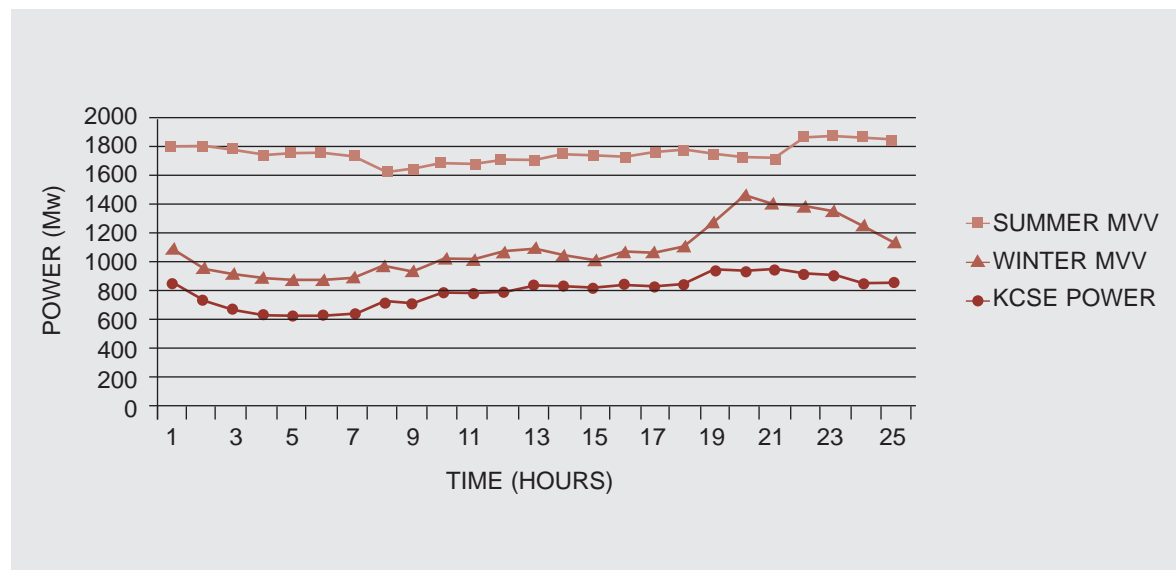
This organisation is integral to WAPDA and was designed to ensure the utilisation of renewable

Graph 17.6: Sectoral Consumption of POL Products in Sindh



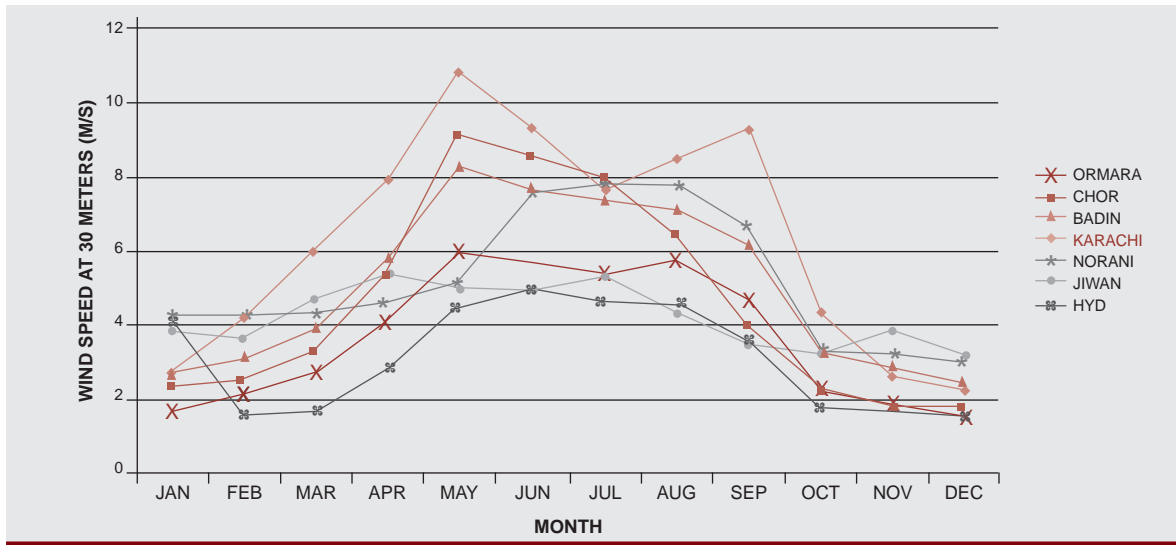
Source: Pakistan Energy Year Books, Hydro Carbon Development Institute, 1993-2001

Graph 17.7: Daily Load Pattern of KESC Grid during Winter and Summer



Source: Khan Nasim A., Energy Resources and Utilization in Pakistan, College of EME, 2000

Graph 17.8 : Suitable Wind Power Generation Sites in Pakistan



energy in the power sector for all villages in Pakistan. Operational wind turbines were shifted to this directorate from the Directorate of New and Renewable Energy under Ministry of Petroleum and Natural Resources. The department has been temporarily closed by WAPDA.

National Institute of Silicon Technology (NIST)

NIST was established to develop low cost silicon solar cells in Pakistan but failed to do so. It has been merged with PCRET.

Pakistan Council for Renewable Energy Technology (PCRET)

This organisation has been involved in R&D activities in silicon solar cells, micro hydel projects, biogas plants and solar thermal applications. It has recently been created by merging Pakistan Council for Appropriate Technology and the National Institute of Silicon Technology.

Enercon

ENERCON's work has been primarily focused on energy conservation and efficiency.

Educational institutions

A large number of universities have conducted research on renewable energy resources. These include the NED and SZABIST universities in Karachi.

Private Entrepreneurs in Renewable Energy Technologies

Of the many such enterprises, those located in Sindh are mostly in Karachi. They include:

- Nice Link Trust, Karachi
- FINATRA Alten, Karachi
- Grid Solar, Karachi
- Solargy Karachi
- Sunpower Systems, Karachi
- TechSpan, Karachi
- Energen, Karachi

These organisations have developed and promoted renewable energy products but most of them are unable to undertake large-scale production. Lack of favourable government support and financial constraints have held them back. Active support for these industries can be mustered with adequate market development through government initiatives to

reduce venture losses in this field. A National Commission for Alternative Energy (NCAE) has been established to ensure the development of renewable energy technologies in Pakistan but has yet to take off.

Involvement of NGOs

NGOs have not been involved in providing energy resources to villages either based on conventional sources or through the introduction of renewable energy resources. NICE Link Trust, Thardeep, National Rural Support Program (NRSP), and ERNP and others, did make sporadic attempts at involving communities but unfortunately, these efforts have not succeeded due to an absence of financial resources and conceptual clarity.

FUTURE ACTION

Investment in the energy sector is determined by the economic viability of a project. This must change and investment in the sector should also be weighed against the social benefits it brings to communities and to small scale economic ventures.

The promotion of renewable energy technologies can meet Sindh's needs efficiently and economically. To make this possible, the Sindh government should enact an Ordinance, prepared in 2002 to promote Renewable Energy (RE) Technologies. The possible text for the Ordinance is given in **Appendix 17.2** along with targets to be achieved and incentives to be provided. In addition, the following goals should be set.

- Conversion of 5,000 homes on RE by the year 2005
- Development of passive solar home designs to suit our environment and culture
- Utilise RE for a number of 10,000 gallons per day water desalination systems
- Ensure 2 percent of RE grid power generation in the province each year
- Micro-finance 5,000 solar cookers, 1,000 solar geysers, 1,000 solar lights. This will result in cash savings and provide local low-tech jobs for poor communities that can be made a part of poverty alleviation programmes.



Pakistan Petroleum

Dehydration plant at Kandhkot gas field, Sindh



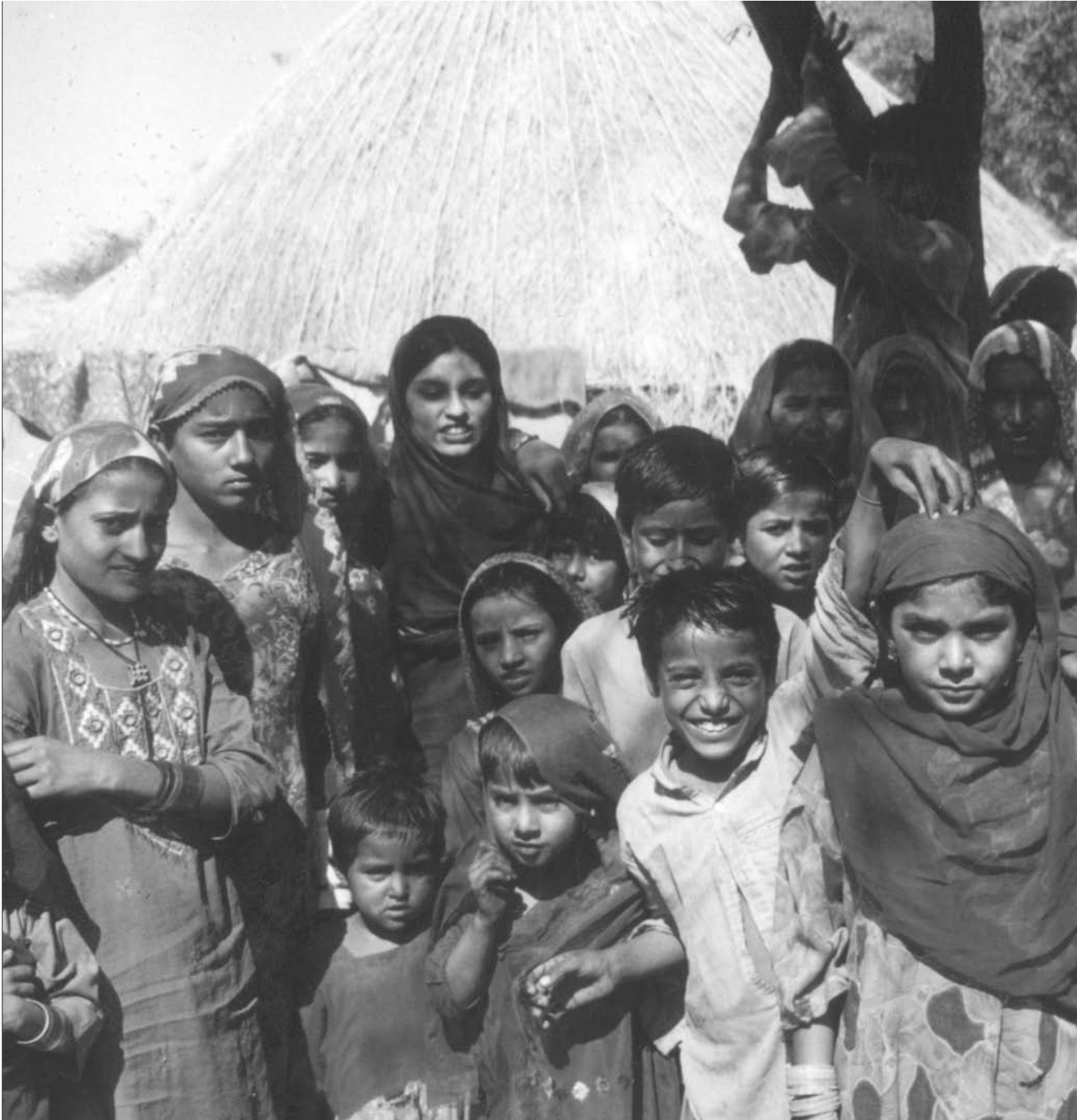
Pakistan has five oil refineries of which the two older and larger ones are located in Sindh

- Introduce RE technology courses in five schools, two colleges and one polytechnic institute in each district, and in all universities
- Train 50 engineers and technologists in the field of renewable energy at the post graduate level. In the field of conventional oil and gas energy, Sindh needs to develop human capital so as to expand, maintain and operate the systems. Institutions where such resources can be developed should be created and sustained.
- Allocate Rs. 500 million to mine the resource
- Train 50 engineers and technologists in coal technology at the post-graduate level

Decision-making regarding the development of energy resources involves many different ministries amongst whom there is little or no coordination. This results in inefficiency which needs to be modified. The Sindh government should create a separate ministry of energy at the provincial level and make efforts to promote this idea at the national level so as to remove constraints that this sector faces today.

Regarding mining, the Sindh government should:

- Reserve the coal block that can be easily extracted and is considered most economical for indigenous development



Social Sectors





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CHAPTER 18

Cultural Heritage and Tourism

Sindh's cultural history is an important part of world culture and deserves an important place in national as well as international strategies for the conservation of heritage. The first historical reference to Sindh is found in the *Rig Veda*, the oldest written record of the subcontinent. References are also found in the *Ramayan* where it is mentioned as the land of "one hundred mountainous peaks". *Mahabharata*, the ancient Hindu epic, also mentions Sindh. Traces of the cultural influence of the Indus Valley Civilization of the third millennium BC are still to be found among the peoples of Sindh.



Sindh's history dates back to the early Stone Age and fossils of Pleistocene, Paleolithic, Mesolithic and Neolithic periods have been discovered in the mountainous areas. A large quantity of ground stone axes and tools were excavated at the stone age tool factories in upper Sindh at Rohri, Sukkur and Kotdiji areas; Site 101 in Thatta district; as well as at Drigh Road, Korangi and Orangi areas in Karachi. In addition, Sindh has two world heritage sites: Mohenjodaro, located on the right bank of Indus in Larkana district, and Makli, the world's largest necropolis (36 km) in Thatta district.

The province has five different geographical regions with a distinct ethnography, dialect and folklore. They are the mountains of Kohistan, the alluvial plains at the foot of the mountains called Ka'achho, the riverine belt of Indus or Kacho, the Indus Delta, and the desert of Tharparkar. The cultural heritage sites of Sindh range from the Stone Age to the Indus Valley Civilization (third millennium BC) and from Jain and Buddhist to the Hindu and Muslim period spread over all the five regions.

The remnants of Jain sites exist only in Sindh's Nagar Parkar *taluka* of Thar where ruins of half

a dozen major temples depict the past glory of Jain architecture. The most important of these sites is the Gori Temple near Islamkot.

Buddhist sites are located all over the plains and also in the western Kirthar Range. The sites and monuments documented during archaeological surveys undertaken between 1993 and 1996 by the Federal Archaeology Department, listed 26 Buddhist sites in eight districts of upper Sindh. The same survey recorded a dozen Hindu sites, while more than 50 Muslim sites are recorded in upper Sindh that include tombs, forts and mosques belonging to the Arghuns, Tarkhans, Kalhora and other Muslim dynasties.

Eighty-four sites in Sindh are protected under the Department of Archaeology, Government of Pakistan, but these sites are badly attended to. These include the Rannikot Fort, believed to be the biggest stone fort in South Asia, its walls stretching over 20 miles. Rannikot Fort is situated 18 miles west of Sann in Dadu district in the Kirthar range and is important not only for its aesthetic value but also as a skillful display of military engineering.



Jamshad Murad

Mohenjodaro on the verge of collapse



Ranni Kot is believed to be the biggest stone fort in South Asia with its walls stretching over 20 miles

HISTORIC TOWNS OF SINDH

By virtue of their past, unique architecture, and eventful history, many cities of Sindh are important heritage sites.

Thatta was an important industrial and trade centre in the early Islamic and medieval periods. It was also a centre of learning with numerous *madrassahs* and schools of higher learning. Thatta has many monuments that are being looked after by the Archaeology Department. Its wind catchers are an important part of its cityscape and are well-known for providing comfort to homes in the heat of summer. However, the town itself has lost most of its vernacular architecture and there is a need to conserve what still exists.

Shikarpur contains some of the most beautiful vernacular architecture in Pakistan, which is fast disappearing. Its beautiful balconies and doors are being removed to become part of the homes of the elite in Karachi, Lahore, Islamabad and other cities. Shikarpur was once

an important town on the trade routes to Iran and Central Asia. Its Hindu merchants had connections from *Shanghai* to *Khiva*, and *hundi*, a form of banking still practiced all over South Asia, was invented in this town.

Besides Thatta and Shikarpur, Sukkur, Bukkur, Rohri, Hyderabad and Sehwan also boast of traditional architecture and important historical monuments. Over time, traditional domestic and commercial architecture is being replaced by badly designed modern buildings. All these towns are in desperate need of a well thought out conservation project.

In addition to the historic towns, there are the nomadic Mohana (fisher folk) settlements along the river banks and around some of the lakes of Sindh. Mohana boats are constructed with intricate mirror embedded floral and geometric patterns. Mohana culture has been adversely affected by the introduction of commercial fishing and the migration of the craftsmen to urban centres of Sindh where they work in the furniture-making trade.

ARCHITECTURE OF THE COLONIAL PERIOD

There are a large number of important buildings of the colonial period in almost all the urban areas of Sindh. Many of them are public sites such as the Law Courts, municipal offices, administrative buildings, schools, colleges, churches, clubs and buildings built by different communities for their social and religious functions and rituals. Most of these buildings are in an advanced state of disrepair and decay and need to be restored and maintained. It is hoped that with the enactment of the Sindh Cultural Heritage (Preservation) Act, 1994, these buildings will not be defaced or altered insensitively.

In addition to buildings of public use, the urban centres of Sindh have large areas that have a number of exquisite domestic and commercial architecture dating from the British colonial period. These areas are under stress due to population pressure and their potential for real

estate development. Again, the implementation of the Sindh Cultural Heritage (Preservation) Act, 1994 offers some hope for the conservation of these buildings, a large number of which have already been listed under the Act, but without a conservation plan, it will be difficult to save much of this heritage.

HERITAGE SITES OF KARACHI

There are a number of cultural sites in and around Karachi which record its long and complex history. For example, the ruins of Rato Kot Fort are located in the vicinity of Korangi Creek. This fort is thought to have been a contemporary settlement of Debal (Bhambhore in the view of some archaeologists) conquered by Mohammad Bin Qasim in 712 AD. Baked earthen balls used in mechanically driven cannons, shards, glazed tiles and other artifacts have been found scattered all over the surface of the site.

The Chawkandi graveyard, a protected monument of the seventeenth century, and Baloch tombs near Memon Goth of Malir, are monumental structures of stone-carved tombs. Mokhi-Matara is yet another cultural site situated on the top of Narathar Hill near Gadap, located on an ancient trade route emanating from Debal port to Central Asia.

The Manora Fort (1784) conquered by Sir Charles Napier in 1839, is also a cultural heritage site as well as the Dumlotti Wells dug by the British rulers of Sindh along the banks of Malir River in the mid-nineteenth century to provide potable water to their military cantonment in Karachi

VERNACULAR LITERATURE

The origin of the Sindhi language dates back many centuries. Devnagri characters were the earliest script of the Sindhi language. The use of Persian- Arabic script was first incorporated into the text in 1050.



Nasir Ali Panhwar

Faiz Mahal, built by the Mirs of Khairpur

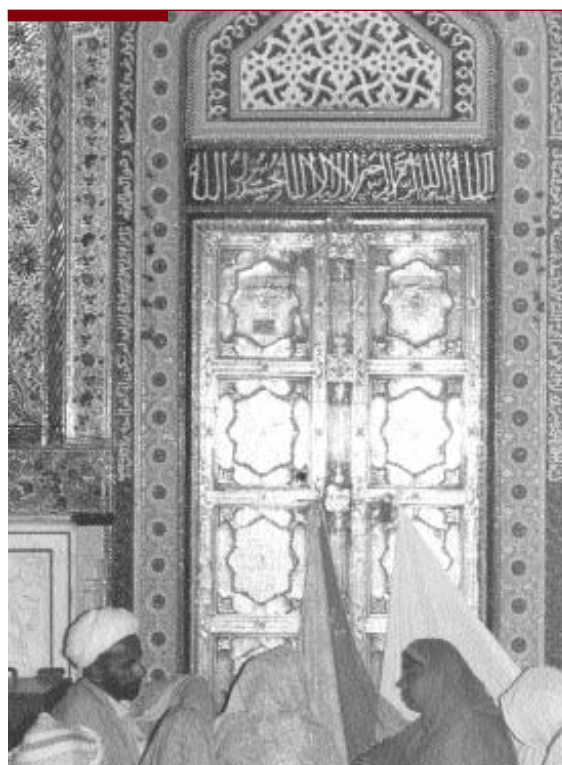
Until Sindhi evolved as a language of the elite, Sindhi historians, poets and philosophers used Persian for their writings. Much of these writings were related to the history of Sindh. The earliest of such writings is the *Chachnama*¹, about Chach, the great Brahman king of Sindh who ruled in the middle of the seventh century. It celebrates the conquest of his kingdom by Mohammad Bin Qasim. Other important writings include the *Tarikh-i-Maasumi*, or *Tarikh-us-Sind*, written by Mir Muhammad Mausumi in 1600 AD, who was a native of Bukkur. The *Tarikh-i-Tahiri*, written in about 1621 AD, is a history of the period from the rise of the Sumras to the death of Ghazi Beg Tarkhan. The *Tarkhan-nama* which is a genealogy and history of the Arghuns and Tarkhans was written by Sayad Jamal Shirazi in 1654. Then there is the *Tuhfat-ul-kiram*, written later, which is a work in eight volumes and constitutes the most comprehensive and consistent history of Sindh.

The first vernacular poet in Sindh appears to have been Syed Abdul Karim, the saint of Bulri in the period of 16th and 17th AD. He composed a religious Risalo which was first written in Persian as '*Bayan ul Arifin*' in 1630 and translated in Sindhi by Abdul Rehman ibn Muhammed Maluk. This work occupies a prominent place in the realm of classical Sindhi poetry and is said to have become the model for all subsequent Sindi poets. His claim to distinction is that he was the great-great-grandfather of Syed Abdul Latif Bhitai (1690-1752), whose *Shah-jo-Risalo* is undoubtedly the most outstanding example of Sindhi poetry.

Mirza Kalechbeg was a reformist writer of the late nineteenth century who translated works of English into Sindhi and vice versa and introduced modern discourses into the Sindhi language.

Around 1936, the Progressive Writer's Movement was dominated by the poetry of Sheikh Ayaz and Narayan Sham (who later moved to India) and Imdad Hussaini. Their work is highly nationalistic and deeply influenced by Marxism. Shaikh Ayaz was particularly popular with his style of *baith* and *wye*, classical in form, but modern in content.

Sindhi journalism proliferated in the mid eighties when serious journals on literary and political issues emerged. However, these



Muhammad Ali Qadri

Pilgrims at Shah Abdul Latif Bhita's Mazar

literary magazines, for instance, *Sohni* of Tariq Ashraf, did not last long. Most of these magazines became daily news oriented and some even took the form of newspapers.

There have been some notable Sindhi biographers like Pir Ali Mohammad Rashidi and his brother Pir Husamuddin Rashidi, an outstanding researcher and writer. Their autobiographies have described social, political and physical conditions in Sindh in some detail during the last century.

Karachi and Hyderabad are also centres of English, Urdu and Sindhi literature and journalism. Most of the Sindhi dailies, the country's major English publications and urdu newspapers are produced in these cities. Karachi publications, however, are usually national in character. In recent years the Province has witnessed a surge of young writers in all three languages.

FOLK FESTIVALS

Sindh has a large number of folk festivals. The most important fisher-folk festival is held every

year in the Wari Creek of the Indus delta at the tomb of Haji Ibrahim in the Shah Bandar *taluka* of Thatta district. On this occasion, colourful masts and buntings of newly polished and decorated fishing boats surround the island of Shah Bandar.

The annual *Urs* (death anniversary) and three-day *Melo* (festival) of *Qalandar Shahbaz* at Sehwan is the biggest folk festival of Sindh. People from all the provinces of Pakistan participate in this festival.

The second biggest congregation is at the shrine of Shah Abdul Latif Bhitai, the greatest *sufi* poet of Sindh. It is held at Bhit Shah in Hyderabad district. The other big festival *Sachal-Jo-Melo* is held every year at Daraza in Khairpur district on the birth anniversary of the great *sufi* poet Sachal Sarmast. The *Melo of Marvi*, the symbol of chastity and patriotism and the heroine of one of Shah Latif's *sur*, is held every year at Bhalwa in Thar.

The festival of *Cheti Chand* is observed in innumerable Hindu temples of Sindh on the New Year's Day of the Hindu calendar. There is a congregation of Hindus from all over

Pakistan and even India at one hundred *tirath* located in different places in Karoonjhar Mountains of Thar. The biggest annual Hindu festival of Sindh is observed at Sadhbelo, a Hindu shrine on an Island in the Indus at Sukkur. The biggest festival of the hilltop people inhabiting the mountains of Sindh is *Gaji Shah Jo Melo* in Johi *taluka* of Dadu district. In addition, at least two-dozen folk festivals are held every year in five distinct geographical regions of Sindh after *Rabi* (winter) and *Kharif* (summer) crops. The popular Sindhi wrestling *Malh* is an event that is always a part of such occasions.

A colonial legacy, the annual Horse and Cattle Show at Jacobabad, introduced by Sir John Jacob more than a century ago during British rule over Sindh, is observed regularly in central Sindh.

ARTS AND CRAFTS

Sindhi arts and crafts cover a wide range. They include textiles; embroidery on silk, cotton cloth and leather; wood and stone carvings; and glazed pottery and ceramic tiles.



Muhammad Ali Qadri

Rali: A traditional bed sheet

Thatta is famous for its woven silk *lungi* in bright colours that are worn as a head dress. Halla is famous for its hand woven cotton textiles and *susi*, which is also woven to form colourful patterns. In Thar, blankets made from camel, goat, and sheep wool hair are woven in geometric patterns in white, black, and red by the women. Previously, they were woven for personal use but now they have a substantial market outside of Thar.

Ajrak, a block printed fabric with rich crimson and deep indigo colours, is perhaps the textile that represents Sindh best. It is an all purpose sheet which can be used as a turban, a *kamarband*, a bed sheet or a coverlet, or slung over the shoulder by men. Women use it as *dupatta* or a shawl, and sometimes convert it into a hammock for a child, slung between two trees. Sindhis show reverence to this cloth and avoid using it as a *dhoti* (below the waist wrap-around). The *Ajrak* has become a symbol of Sindh and guests are presented with it by their hosts.

Sindhi embroidery has a strong Baloch influence in the north and strong Rajsthani influence in the Thar Desert. It is done exclusively by women and is both geometric and floral in design. Previously, it was done for the use of the family but now it has become a major commercial enterprise and is adapting to the needs of the market.

The glazed floral and geometric design on tiles and pottery is known as *kashi* work. It has both strong Persian and Rajsthani influences. The Halla *kashi* work uses blue and turquoise colours while the Sehwan *kashi* work uses browns and yellows for the most part. Tiles with *kashi* work have been used extensively in Sindhi architecture and in recent years there has been a revival of their use.

Sindhi carpenters and masons have traditionally produced beautifully carved floral and geometric designs in timber, stone and gypsum plaster work. These have been used in architecture, boat building, saddles of pack animals, animal-drawn carts and rural buildings. Most of these skills are dying out since these crafts are no longer used by households for the purposes that they were initially meant for nor is there state patronage to keep them alive and provide alternate livelihood to the people.



Muhammad Ali Qadri

Glazed floral and geometric designs on tiles known as *Kashi* work painting

TRADITIONAL MUSIC AND DANCE

Music is the favourite form of recreation for the people of Sindh. The tradition of dancing and singing in the Indus Valley goes back to pre-historic times. The discovery of the dancing figurine from Moen-jo-daro and the motif of a dancing couple from the site of the ancient city of Debal is evidence that indicates the presence of music and dance from pre-historic times.

The various schools of Sindhi music are given below:

Wae is a form without percussion and is sung at Shah Abdul Latif's shrine. Its invention is credited to him when he set his verses to differing musical scales. The *Wae* contains *Leh* and *Sur* steeped in emotion. Fakirs trained in the classical tradition sing all night, every night and Allan Fakir, a secular man, is the best known among them. Allan Fakir is generally believed to be the greatest *Wae* singer of Sindh.

Music that commands the greatest respect is devotional in character. The poetry of *sufis*, usually in *kafi* form, is always recited, with or without instrumental accompaniment. It is sung with devotional zeal till one reaches mystical ecstasy. Most singers are from the rural areas, but several of them have moved to urban centres. The *kafi* is a poetic form and is the chief vehicle for communicating *sufi* poetry which is sung to the accompaniment of the *alghoza*². Legendary *sufi* singers include the *bakhti* singers of low caste Hindus like Kanwar Ram, Mohan Bhaget, and Jewani Mai. More recent singers in the tradition are Master Jumman, Ghulam Hussain Shaikh (Abida Perween's husband and mentor), and Abdul Ghafoor. Maestros like Abida Perween, Singhar Ali Saleem, or Abdullah Kachi³ can transport their audience to twelfth century India when *sufi* saints like Bahauddin Zakariya and Khawja Moinuddin promoted devotional music. *Soung* is another form of devotional music, which is

rendered standing in front of the tomb of the saints and owes its allegiance to the Chistia School of *sufi* song. Sohrab Faqir from Khairpur is a well-known performer of this genre.

The classical form of Sindhi music draws heavily from the regional and folk music. The Gawalior *gharana*⁴ (family) that settled in Tando Adam still dominates classical music in Sindh.

Shah Abdul Latif Bhitai's *Shah jo kalam* rendition is carried out in a style he invented and which was promoted even after his death. In the mid-nineties, the Sindh Department of Culture decided to offer stipends to families who performed this traditional narration. This has helped in reviving this tradition.

Mai Bhagi of Tharparkar best represents regional folk music. Her daughter has now taken over from her. Haider Rind, Kanwar Bhagat, Mohan Bhagat, Fakir Amir Bux, the late Fakir Abdul Ghafoor and Zarina Baluch are important names in contemporary Sindhi music⁵.

The beauty of Sindhi music lies in its simplicity and the use of few instruments as compared to most other regions of South Asia. These instruments include the *yaktara*, *garha*, *chapri*, *nar* and the *dhol*. *Nar* music consists of short melodic patterns and the *dhol* consists of short rhythmic patterns, which may be combined. Sindhi musical instruments also include the double reed *shahnai* or *sharnai*, and there is a well-preserved local tradition of *shahnai* playing.

The indigenous musical instruments of Sindh include the *borindo*, which is a clay ball with three holes on its body. This ancient musical instrument was originally excavated from the ruins of Mohen-jo-Daro. *Dambooro*, *yaktaro*, *sarangi*, *chang*, *nafeel*, *tootoori*, and *dholak* are some of the other local instruments that are in use⁶.

The most popular folk dances performed to Sindhi music are *jhummar* (performed by women), who move slowly in circles, and the *ho*



Muhammad Ali Qadri

Allan Fakir: the greatest *Wae* Singer of Sindh

2. Qureshi, R B, "Music and Culture in Sindh - An Ethno-Musicological Perspective" Sindh Through the Centuries. ed Hamida Khuuro. Oxford University press, Karachi
3. Names given by Kaleem Lashari, Director Sindh Archives, in an informal talk related to music
4. From Kaleem Lashari
5. Rhythms of the Lower Indus - *Perspectives on the Music of Sindh*, edited and compiled by Zohra Yusuf
6. Sindh Census Report, 1998



Maestros like Abida Parveen can transport their audience to the 12th Century when *sufi* saints promoted devotional music

jamalo dance performed by both men and women. Both these dances are performed at the fairs and festivals in the province. The *dhamal* is performed at the tombs of the saints during which the devotees reach a state of ecstasy⁷.

SPORTS AND AMUSEMENT

The traditional sports in Sindh are ***Bitharo*** - a rough kind of prisoner's baseball; *Gili Dakar*, which is like tipcat, and *Tisi*, which is a form of hopscotch. In addition, playing marbles and flying kites are common both in rural and in urban areas. Wrestling, in a style peculiar only to Sindh, is called *malakahkro*, which is popular throughout the province with competitions being held on holidays and Fridays that are a feature of all fairs. Cock, partridge, and quail fighting are also common and are combined with gambling.

Dharo or *Chaupar*, a game played with dice on a board or a cloth, were common earlier on but with urbanization and new forms of entertainment the traditional sports are dying out. Most large landlords engage in hunting,

falconry, and horse racing. They also arrange dog and wild boar fights where dogs attack a wild boar in a pit. For the general public, there are also horse and cattle shows of which the one in Jacobabad is the most popular.

Nowadays, cricket, hockey and football are played by children and young men both in the urban and in the rural areas of Sindh.

PRESENT SITUATION

In 1972, the Government of Pakistan, headed by the Prime Minister Zulfikar Ali Bhutto, set up a National Committee to look into the preservation of Mohen-Jo-Daro. The UNESCO Master Plan to Save Mohen-Jo-Daro devised in 1974, aimed to lower the groundwater table at the site, which was destroying the ruins. The plan also suggested proper conservation of the ruins, promotion of cultural tourism and plantation of trees around the site.

The regime of General Ziaul Haq stopped the international campaign initiated by the Bhutto

7. Ibid

government. The government of Nawaz Sharif disbanded the Authority for the Preservation of Mohen-jo-Daro (APM) in 1997. The present administration of General Pervez Musharraf has constituted the National Fund to Save Mohen-Jo-Daro (NFM) in March 2000 with the leftover APM budget of 94 million Rupees. Some conservation work was initiated but ever since the burgeoning water crisis in Sindh, all activities of the NFM have come to a standstill.

The authorities have not only failed to preserve the excavated ruins, but have also damaged the unexcavated structures in the name of preservation. While digging for the construction of a circular drain in and around Mohenjodaro for disposing of water pumped by the tube-wells in the nearby Dadu canal, a number of original structures were bulldozed.

The process of decay at the Makli necropolis at Thatta continues, with the federal Department of Archaeology complaining of insufficient funds to repair the monuments. Theft of carved stones at Makli has increased in recent years as the authorities are unable to guard the vast almost 20 km necropolis.

The destruction of Sindh's traditional architecture, both in urban and rural areas, is continuing at a fast pace. This is because of the absence of trained people to promote, and implement their conservation. Similarly, Sindh's traditional crafts related to architecture are dying because they are not employed in modern architecture.

Traditional fabrics are not attracting international buyers at a large enough scale so as to be commercially viable. There is a need for understanding the international market and modifying traditional designs to suit modern requirements. The necessary research and extension programmes to carry out this exercise are not in place.

CAUSES FOR THE PRESENT SITUATION

Archaeological Sites

The most critical factor affecting the heritage sites located in the plains of Sindh is the



Nasir Ali Panhwar

Traditional Wrestling: Malakhro

adverse natural environment; especially the menace of waterlogging and salinity caused by bad irrigation practices. This was the main problem addressed by the UNESCO experts while devising the Master Plan to save Mohen-Jo-Daro in the early seventies.

Experts suggested lowering the water table, but such measures could not be extended, due to financial constraints. Innumerable other sites in Sindh are suffering due to waterlogging and salinity.

At the time of independence, the Ancient Monuments Preservation Act 1904 gave some legal protection to cultural heritage. Immediately afterwards, the Antiquities Export Control Act 1947 was enacted to control and regulate the traffic in antiquities, both within and outside the country.

The Antiquities Act 1968 replaced both these acts but because it was inconsistent with the fundamental rights enshrined in the Pakistan Constitution, a new act in 1975 replaced it to remove certain shortcomings. Further amendments were made periodically in 1978 and 1992.

The Antiquities Act of 1975 is considered quite effective, provided it is administered. For its proper administration, the federal Department of Archaeology needs adequate staff. For instance, the Talpur Committee set up by the Government of Pakistan in 1979 recommended, besides other measures, a round-the-clock vigilance at monuments/sites. At many sites, there are no watchmen at all. At major sites like Makli, the watch and ward staff is too small in number to prevent thefts of antiquities and trespassing.

Urban Built Heritage

Urban built heritage which is located in all the major cities of Sindh is under pressure from rapid population growth and the resulting real estate development. It is also under pressure from the expansion of inner city wholesale markets and industrial activity that requires storage and manufacturing spaces for which the urban development authorities have made no provisions. This state of affairs can only be

rectified if proper structure and/or master plans are made for the urban areas and are implemented. The awareness and the political will to do this are lacking. The universities and professional academic institutions do not produce trained personnel who can undertake conservation related programmes and projects.

THE EMERGING TRENDS

The Sindh Cultural Heritage (Preservation) Act, 1994

An important trend has been set in the province by the enactment of the Sindh Cultural Heritage (Preservation) Act 1994. Through proper implementation, not only monuments but also archaeological sites can be saved from demolition.

The Antiquities Act of 1975 was revised, amended and updated in 1976 but it was a federal act and was able to fulfil the individual needs of the provinces.

Compared to the federal Act, the Sindh Cultural Act 1994 is more comprehensive as it aims at preserving and protecting "ancient places and objects of architectural, historical, archaeological, artistic, ethnological, anthropological and national interests" in Sindh. So far, over 700 buildings have been listed as protected.

However, there are no funds available to develop the institutions required to monitor and document the listed buildings, to provide technical assistance and incentives to the owners to look after or develop adaptive reuse plans for them. In the absence of such institutions, the land-grabbing developers have demolished many listed buildings.

The enactment of the law and the initial listing of buildings have had a fairly positive impact. The demolition of at least the listed buildings has been arrested. The listing has also created awareness of the importance of the built heritage in the areas where the buildings are listed. A cell has been set up in the Karachi Building Control Authority (KBCA) for approving development and/or rehabilitation plans for the

listed sites. Thus, awareness has also been created in the KBCA and hopefully this will lead to the creation of expertise. It is important to note that the Sindh Cultural Heritage (Preservation) Act, 1994 was the result of intense interaction between concerned citizens, conservation-related NGOs, politicians and the Sindh Cultural Department.

Awareness Created by NGOs

A number of NGOs are now involved in the promotion of culture in Sindh. These include the Sindh Exploration and Adventure Society which undertook the Indus Expedition in 1989 and documented it. The Society has also documented Rannikot and discovered the Babra ruins of the Indus Civilization in Thano Bulla Khan. The Sindh Adabi Board has promoted Sindhi literature, and the Heritage Foundation in Karachi played an important role in the process that led to the enactment of the Sindh Cultural Heritage (Preservation) Act 1994. Recently, the Karachi Arts Council and the Mohatta Palace Museum have been actively conducting programmes and exhibitions related to Sindh's ancient culture.



Jamshed Masood

Rehabilitated Anne Basant Hall in Hyderabad

Academic Institutions

A number of academic institutions in Sindh are engaged in carrying out research and developing skills that will hopefully overcome the constraints that are preventing the protection of Sindh's cultural heritage and its integration into modern forms of literature, art, architecture, textile and ceramics. These include the Sindhiology Department at the University of Sindh, Hyderabad; the Mohatta Palace Museum (which holds exhibitions, lectures and musical events related to Sindh as well as producing publications related to culture); the Architecture and Planning Departments at the University of Karachi, Dawood College Karachi, NED University, the Indus Valley School of Art and Architecture at Karachi and the Textile Institute of Pakistan in the Thatta District. Professionals produced by these institutions are already creating awareness in society on culture related issues.

Many un-excavated archaeological sites of Sindh have been bulldozed and incorporated into agricultural land. Some of them have become part of the urban sprawl and have been turned into informal settlements. This is a trend that is increasing in the absence of protection for the sites and pressures from an expanding human population. In addition, the theft of antiquities is increasing and the weak state infrastructure can neither prevent it, nor is it able to punish those engaged in this activity.

The Department of Culture and Tourism as well as the provincial Directorate of Archaeology are not initiating any excavations for new sites because of an absence of financial resources.

STAKEHOLDERS

The stakeholders include the Government of Pakistan; the Government of Sindh and its Local Bodies; the national and provincial institutions dealing with history, archaeology, and culture. These institutions include the Ministry of Culture and Tourism; the Pakistan Tourism Development Corporation (PTDC); the Department of Culture and Tourism; the Sindh Tourism Development Corporation (STDC); and the Directorate of Archaeology, Government of

Sindh. They also include the government-run Sindhi Adabi Board, Sindh Text Board, Institute of Sindhology, the Sindh Language Authority (SLA) and NGOs representing civil society. Communities are also major stakeholders and so are cultural bodies and academic institutions and individuals that have the background in research and exploration.

FUTURE ACTION

The Department of Culture and Tourism, Government of Sindh, as well as the provincial Directorate of Archaeology should initiate exploration on a number of sites that have been identified. Attempts at raising the resources for this work from the corporate sector, international agencies and provincial government sources need to be made. Public opinion and funds should be mobilized for this work. If funds are in short supply, the endangered monuments and sites should be identified and listed. They should be surrounded by barbed wire and a caretaker appointed to look after them. Their rehabilitation and/or excavation should wait till such time when funds are available. The federal Department of Archaeology and Museums initiated a 'Sindh Survey Project' in the late nineties to discover more heritage sites in Sindh, but the fieldwork was stopped midway.

The cultural wealth of Sindh is so vast and varied in nature that it has not been possible for the federal Department of Archaeology to manage it properly single-handedly. The Pakistan History Conference held in Karachi in October 2001 had passed a resolution urging provincial governments to establish their own respective departments of archaeology. Punjab has set a precedent in this regard. Perhaps the proposed provincial department, under the Government of Sindh, may initially only look after those heritage sites that are not under the care and control of the federal government.

It is necessary to frame area conservation programmes for the built heritage of the urban

centres of Sindh. However, for the development of area conservation, expertise is necessary. It is recommended that built heritage conservation programmes should be initiated in the three public sector architecture and planning departments. If necessary, foreign professors should be invited to initiate these courses. Area conservation should be seen as part of a larger city planning exercise, and master structure plans for the major cities where this built heritage is located are necessary.

Strict implementation of the Antiquities Act by the provincial government can be an important step towards safeguarding the heritage. The State can play a vital role in this matter whereas the private sector and non-governmental agencies can contribute considerably through public mobilization and professional activism.

The setting up of site museums can provide an opportunity to research scholars to study the antiquities at excavated sites. The potential of tourism in Sindh, given the diverse nature of its natural environment, built environment, archaeological sites and living culture, is immense. For promoting tourism in Sindh, the government must: construct approach roads to various tourist sites; construct rest areas; provide public and private transport to the sites; conduct organized tours from centres such as Karachi, Hyderabad, Dadu, Larkana, Sukkur, Nawabshah and Mithi; and publish guidebooks for tourists.

For conservation of Sindh's cultural heritage and the development of culture and tourism, a combined approach of partnership between the public sector, the private sector (such as hotels, tour operators and tourist guides), civil society, academia, media, adventure groups and interested individuals is highly recommended. But for this to materialize, the law and order situation in Sindh, which is related to political conditions and the unaddressed repercussions of social change, has to be addressed.



CHAPTER 19



Environmental Health



Environmental degradation has a major impact on human health. It is a fast emerging area where much attention is being given to understanding the health impacts of degradation and to find possible solutions to address them. Environmental health deals with those aspects of the surroundings, substances and conditions of people that have an impact on community health. It basically means being free from illness or injury that is the result of toxic agents or other environmental conditions.

According to a study by UNICEF's Multiple Indicators Cluster Survey, 1995 for Sindh province, 81 percent (highest amongst the four provinces) of children below five years of age, have developed acute respiratory infections. Another study conducted by PMRC, reports that 9.6 percent children under five years of age have developed wheezing¹.

HIGH LEAD LEVELS

In Karachi alone, nearly half a million vehicles on the roads emit carbon monoxide and nitrous oxide, along with unburnt fuel and a substantial quantity of lead. According to studies conducted in Karachi, the highest smoke concentration was found at Tibet Centre, where it was 270 ug/m³ in 1975, 598 ug/m³ in 1982 and 623 ug/m³ in 1983. Nearly 23 percent of the patients at Civil Hospital Karachi complained of respiratory tract infections².

Several studies have documented the repercussions of a high level of lead in the atmosphere in Karachi. On human life in 1989, a study reported mean blood lead level of 38ug/dl among relatively healthy school children in one of the highly congested areas of Karachi³. High lead levels were found in blood samples of traffic constables serving in the main city areas⁴. In another study conducted in 2000, of the 400 children aged between 36 to 60 months, 80.5 percent had blood lead levels of more than 10 ug/dl⁵. These children lived within the city centre as well as on the outskirts. Lead levels are significantly higher than the WHO-recommended safety levels.

The main source of lead is exhaust fumes from automobiles, lead-based paints, and battery-smelting factories. Lead accumulates in the environment over a period of time and does not lose its toxicity. Any level of lead exceeding 10ug/dl is considered hazardous⁶.



Sana Raza

Katchi abadi surrounding the Lyari sewage in Karachi

1. National Health Survey of Pakistan, Profile of the People of Pakistan; PMRC, 1990-94
2. Beg, A. and Yousefzai, K. 1987. Air Pollution in Karachi, Pak J Soi Indust, Res 30 (1) 60-70
3. Manser W.W. 1990. Trace Element Studies on Karachi Population, Part V: Blood Lead Levels in Normal Healthy Adults and Grammar School Children, JMPA 150-154
4. Sadruddin A. Manser. 1992. Blood Lead Levels in Traffic Constables in Karachi, Pakistan J Envir Health, 55 (1), 20-22
5. White F. and Rahbar, H. 2001. Elevated Blood Levels in Karachi, Pakistan, Bul. WHO; 79 (2), 173
6. White F. and Rahbar, H. 2002. Factors Associated with Elevated Blood Levels Among Children in Karachi, Pakistan. WHO, 80 769-775



Inner City Degredation

WATER-BORNE DISEASES

In a study conducted in Karachi in 1997, 293 drinking water samples were tested and only 48 (16 percent) were considered safe. Of the 233 samples analysed, 63 percent were contaminated with MPN > 50⁷. In another study conducted in Karachi in 2000, stored drinking water samples were found to be contaminated from 75 percent households with a geometric mean of 10,990 cfu/100 ml of thermo tolerant coliforms⁸. The concentration of E.Coli varied from 14 -130 cfu/100 ml. According to the WHO, no detectable E.Coli should be found in clean drinking water.

Another study conducted by the Department of Energy and Environment, Sindh Agricultural University, Tando Jam, showed similar results. Around 295 drinking water samples were collected from canal water, hand-pumps, wells,

ponds, and municipal water supply from Thatta, Badin and Tharparkar. Nearly 100 percent samples of canal water and drains were contaminated with thermo tolerant coliforms while 76 percent of samples of hand/motor pump, well and municipal supply had thermo tolerant coliforms. The above studies indicate the presence of highly contaminated drinking water at the source⁹.

Such severe water pollution results in various enteric diseases, especially gastroenteritis. According to UNICEF's Multiple Indicators Cluster Survey (MICS) 1995, 26 percent of children under five years of age suffered from diarrhoea in the peak summer season in Pakistan with the incidence being highest in Sindh (33 percent)¹⁰. According to the National Health Survey of Pakistan 1996, 35.9 percent children in Sindh suffered from acute diarrhoea during the time the survey was being conducted¹¹.

7. UNICEF. 1998. Children and Women in Pakistan: A Situation Analysis
 8. Luby S. and Agboatwalla M. 2001. A Low Cost Intervention for Cleaner Drinking Water in Karachi, Pakistan, Int J. Dis 5:144 - 100
 9. Soomro S. Punoooh. 2000. Studies on the Status of water Bodies in Rural Sindh and Their Effect on Human Health, Dept. of Energy and Environment, Sindh Agricultural University, Tando Jam
 10. MoH, GoP, and UNICEF. 1995. Multiple Indicators Cluster Survey of Pakistan
 11. National Health Survey of Pakistan. 1995. PMRC



Dangerous hospital waste litters the street

Through verbal autopsies conducted in Karachi in 1997, it was revealed that 39 percent children experienced episodes of acute diarrhoea¹². In another study conducted from 2000-2001, in which 2000 children were observed over a period of two years, it was seen that 1.51 new episodes of diarrhoea occurred per 100 person weeks of observation between May and October 2000, while between June and October 2001, children developed 2.02 new episodes of diarrhoea per 100 person weeks of observation¹³. This high incidence of diarrhoea points towards the poor state of water and sanitation.

Typhoid

Enteric fever or Typhoid is an infection that is endemic but may assume epidemic proportions in summer due to the presence of Salmonella Typhi organisms in contaminated water and food. At the Aga Khan University Hospital (AKUH), Karachi, between June 1990 to December 1994, 4,439 people had Salmonella

Typhi isolated from their blood or bone marrow. Of these, 1,441 (33 percent) were isolated from children under six years of age.

In the PNS Shifa Hospital, Karachi, 412 confirmed cases of Typhoid were seen from January 1996 to April 1999. It has also been reported that at the AKUH, 7.1 percent of all blood cultures received over a three-year period 1992-1994 grew Salmonella Typhi. Typhoid fever spreads through the oro-faecal route and transmission is highest in areas of poor sanitation, especially in urban slums where sewage water mixes with piped water.

Hepatitis

Hepatitis A is also an enteric infection occurring due to contaminated water and food which is transmitted through the oro-faecal route. In a study conducted in 1994 on children, it was seen that 94 percent children develop IgG antibodies against Hepatitis A virus by three years of age¹⁴. In another study conducted by Qureshi

12. Luby, S and Syed A. 1997. The Limited Effectiveness of Home Purification of Drinking Water in Karachi, Pakistan

13. Ibid

14. Agboatwalla, M. and Isomura S. 1995. Enteric Viral Infection in Pre-school Children in Karachi, Pakistan, *Ind. J Paed* 62:345-351

et al. in 2000, it was seen that 19.4 percent children had developed anti-bodies against Hepatitis E virus¹⁵.

HEAVY METAL CONTAMINATION

Heavy metals, along with other pollutants, are discharged into the environment through industrial waste, automotive exhaust, heavy-duty power generators and through refuse burning. These heavy metals are then taken up by plants, animals and humans, and accumulate in the vital human organs over a prolonged period of time.

In Karachi, more than 6,000 industrial units, accounting for 60 percent of the country's industries, are located along the coastal belt and the Indus Delta. With the exception of a few units, almost all the industrial units discharge their untreated effluent containing heavy metals and their compounds, detergents, lubricating oils, chlorine and various organic and inorganic toxic compounds directly into the Lyari and Malir rivers and other water bodies from where they in turn discharge into the Arabian Sea.

According to a study conducted in 1994, solids of up to 1,000 tonnes per day from the River Lyari are discharged into the Arabian Sea¹⁶. Extremely high levels of copper, lead and zinc were found in the Lyari effluent. The National Institute of Oceanography estimates that 120 mgd of effluent reaches the Arabian Sea from the Lyari River each day. This volume comprises of 40 percent domestic and 60 percent industrial waste.

As a result, the marine environment is highly toxic and fish and shrimps accumulate a high degree of lead from heavy metals. In another study conducted in 1992, water samples were collected from Baba and Manora Channels¹⁷. Out of 60 sea water samples lead was present in high concentration in 55 samples and zinc in 58 samples. The concentration of lead was 59.2 ppm and the concentration of zinc was 1.9 ppm.

In another study, vegetable samples were collected from farms located along the Lyari and Malir Rivers¹⁸ and high levels of zinc and copper were detected from all of them. Spinach had a high concentration of lead; betel leaves had a high quantity of copper (820 mg/kg), nickle (330 mg/kg) and zinc (134 mg/kg). Eggplant also contained a high quantity of copper (140 mg/kg) and zinc (480 mg/kg).

Heavy metal contamination of water is not confined to urban coastal areas. In the rural areas of Badin, Thatta and Tharparkar, water samples from canals, hand pumps and wells also indicate heavy metal contamination. The load of Total Dissolved Solids (TDS) in the water was much higher than expected, with 37 percent samples showing TDS level to be above the permissible 500 ppm. In Tharparkar, the TDS was as high as 8800 ppm. 23 percent water samples from hand pumps and 10 percent from the canals had more than the minimal permissible limit of 1.0 ppm of iron. Copper and zinc levels were within permissible limits.

These effluents have direct and indirect effects on health. Increased levels of cadmium and chromium are carcinogenic and lead produces anaemia by restraining haemoglobin synthesis. Increase in population, rapid urbanisation and unplanned development of settlements have taken a toll on the environment. Polluted air, contaminated water, over-crowded unserviced settlements, dumping of toxic waste, contaminated food, inadequate diet and stress are just a few causes of the prevalent health situation in the province.

EMERGING TRENDS

Initiatives by NGOs

Several NGOs have come forward to help the government grapple with the health crisis generated by environmental pollution. Many pilot projects have been initiated by them which can be replicated and expanded. It is observed

15. Qureshi, H. and Hafiz, S. 2002. Exposure Rate of hepatitis A and E (IgG) in Children 50 (8), 284-5

16. Lyari and Malir Rivers Pollution Study, 1994. GoP - EPA

17. Beg, M. A. and Mahmood S. N. 1992. Heavy Metals Pollution in the Coastal Environment of Karachi, Pak J Marine Sc. 1 (2), 117-128

18. Yousufzai, A. H. and Hashmi, D. Heavy Metal Accumulation in Vegetables and Soils at KMC Sewerage Farm in SITE, PCCSIR. Karachi

that most NGOs are working towards achieving a long-term goal of bringing about behavioural changes among communities. For example, a home based system of chlorination initiated in the informal settlements of Karachi through Health Oriented Preventive Education (HOPE) in collaboration with the Centre for Diseases Control (CDC), Atlanta, Procter and Gamble, Cincinnati; and the Community Health Sciences Department of the AKUH, in Manzoor Colony, proved that the incidence of diarrhoea can be reduced through provision of safe means of drinking water¹⁹. Community participation played an important part in the success of this strategy.

Another pilot project was initiated by HOPE in collaboration with CDC, Atlanta, Procter and Gamble, Cincinnati and the Community Health Science Department, in which hand washing was promoted in an informal settlement of Karachi²⁰. The water in this locality was heavily contaminated with bacteria. There was no regular system of garbage collection and removal and sewerage commonly drained through open unpaved channels. A regular supply of soap was provided to mothers with children under five. It was observed that the incidence of diarrhoea among children these children was 39 percent lower than in those households with standard washing and cleaning habits.

Elimination of lead intoxication is an achievable goal and the Community Health Sciences Department, AKUH, is working with the government and the private sector to develop prevention programmes to raise awareness, to identify affected populations, and to take whatever actions are feasible to control and eliminate sources of exposure. In this regard, contact has been made with leading oil companies, oil refineries, lead related factories and companies.

In environmental sanitation, the Orangi Pilot Project-Research and Training Institute (OPP-RTI) has developed a community financed and managed low cost underground sanitation project, which has reached out to about one

million Orangi residents and has also improved health conditions in other *katchi abadis* which have adopted the programme. The OPP-RTI model has also been adopted by the Sindh *Katchi Abadis* Authority (SKAA) for its *Katchi Abadi* Improvement and Regularisation Programme (KAIRP). As a result, the KAIRP has become entirely community financed and is no longer dependent on foreign loans as it was earlier.

United Nations Children's Fund (UNICEF), with its Master Plan of Action (MPA) 1999-2003, is aiming at promoting inter-sectoral linkages, particularly with health and education, through fostering partnerships between government organisations attached to various ministries including the Ministry of Health, Ministry of Environment, Local Government and Rural Development and Ministry of Education. The Water Environment and Sanitation Society (WESS) programme aims at intervention at the community level to improve their hygienic practices such as washing hands after defecation and before handling food, the use of soap and the maintenance of latrines. The ultimate objective of the programme is to reduce child morbidity and mortality due to death by dehydration caused by diarrhoea. The strategies focus on the need to change individual awareness and behaviour concerning personal and food hygiene. The intervention aims at integration of activities within the sector and with other sectors such as health, women and education.

Compressed Natural Gas (CNG) is being promoted by the government for use by vehicles. The promotion of CNG will lead to a marked improvement in air pollution levels if a low cost CNG conversion kit can be developed for diesel public transport vehicles.

STAKEHOLDERS

The stakeholders concerned with environmental health include the Environment and Urban Affairs Division, Ministry of Housing and Works; the Sindh Environmental Protection

19. Luby, S. and Syed A. 1997. The Limited Effectiveness of Home Purification of Drinking Water in Karachi, Pakistan

20. Luby, S. and Agboatwalla, M. 2001. Microbiologic Effectiveness of Hand washing with Soap in an urban squatter settlement, Karachi, Pakistan *Epid Infec.* 127: 237-244

Agency; Sindh Health Department; Sindh Motor Vehicle Authority; international environmental agencies such as IUCN, UNIDO; UNICEF; UNDP; NGOs; WAPDA; district governments; mass media; research institutes; civil society organisations and communities.

FUTURE ACTION

Tackling environmental issues is not just the job of government institutions. To achieve optimum results, all the stakeholders have to coordinate their activities.

The extent of the damage and its causes has to be measured by conducting studies and surveys and establishing databases. These should be carried out by the Department of Health, Bureau of Statistics and the Environmental Protection Agency, in collaboration with other stakeholders.

Currently, the health department is concerned mainly with providing curative health. The concept of preventive and environmental health needs to be introduced and developed within the department. For this, the Department requires technical assistance to develop a plan of action, which can be provided by environmental agencies and NGOs.

Environmental issues and programmes related to health should become a part of primary and secondary school education. Environmental repercussions of development and social change should form part of university courses dealing with social, technical and science related disciplines. Without the development of



Mohammed Anees Sheikhzad

Uncontrolled amounts of waste dumped at Lyari River, Karachi


professionals and a public that understands and can deal with these issues, the causes of environmental degradation cannot be addressed.

The mass media should be used to promote an awareness of the repercussions of environmental degradation and the manner in which they can be overcome or mitigated. The programmes on television and radio should not be a mere identification of issues, but the spirit of self help should be built into entertainment programmes.



CHAPTER 20

Population, Poverty and Environment



Poverty is not simply about monetary deprivation but about inadequate access to resources. Conventionally, income and consumption levels were considered the accepted and measurable definition of poverty.

However, new thinking suggests that these are limited and do not capture all the elements of poverty. A new methodology known as Sustainable Livelihoods framework has been postulated, which takes a broad-based approach to assessing deprivation, and particularly emphasises the importance of vulnerability and powerlessness, in addition to the other aspects of poverty.¹

1. IUCN, P&DD Northern Areas, Iftikhar, Usman Ali 2003: Population, Poverty and Environment

The incidence of poverty is one of the most important indicators of socio-economic conditions. There was a declining trend in poverty in Pakistan during the 1970's and 1980's, but this was reversed in the 1990's. According to the UN Human Development Report, Pakistan has very low ranking on the human development index (HDI) where it is placed at 127 out of 162 countries. In terms of HDI ranking within Pakistan, the urban areas of Sindh have the highest ranking, with an HDI of 0.659, which is higher than for Pakistan as a whole but the rural areas of Sindh have an HDI of 0.456, which is the lowest in Pakistan. One of the main causes for Sindh's high HDI is the dominance of the urban population (40 percent in 1975; 48 percent in 1995)². This suggests a larger urban/rural disparity than in any other province of Pakistan.

There is also immense disparity in human development in Sindh's districts and cities, with Karachi's HDI (0.629) being the highest and that of Tharparkar (0.343) being the lowest. There are major inter-provincial differences with relation to the HDI, with Sindh containing only 13 percent of the top districts ranked high in the HDI. It also consists of 19 percent of the lowest ranking districts according to the HDI in Pakistan³.

Although economic vulnerability has not been comprehensively measured for the province, there are indications that vulnerability differs significantly across agro-climatic zones and over two-thirds of the households in rural Sindh may be classified as economically vulnerable.

Poverty has become a major issue in Sindh, where 50 percent of the population lives below the poverty line and suffer from low calorie intake, low per capita income, unemployment, inadequate access to education, sanitation, health facilities and an unhygienic environment. More importantly these people are the most vulnerable to shocks.

The present situation in Sindh can be looked at in the context of the various issues it faces and

measures that have been taken by the government and other organisations, such as the NGOs, in an attempt to alleviate poverty.

INCOME AND EMPLOYMENT

Income is one of the basic indicators of social well being. Sindh had the highest per capita income from 1975-1995, and incomes in this period had a faster rate of growth than in any other province⁴. The gap between per capita incomes in Sindh and Punjab (the province with the lowest per capita income), in 1975 was Rs.1,250 per year. By 1995 this gap had increased to Rs. 2,800 per year. The Gross Regional Product (GRP) per capita at 1980-81 prices was the highest in Sindh at Rs. 5,327 per year (1995) and second lowest in the Punjab (right above Balochistan) at Rs. 4,107 per year (1995)⁵.

Despite the above figures, more than 11 million men and women in Sindh are unemployed and around 15 million live below the poverty line. According to the Pakistan Poverty Reduction Strategy Paper (PPRSP), population below the income poverty line of one USD per day is 31 percent, which implies that every third household in Pakistan lacks sufficient income to afford the daily intake of 2,350 calories per person. The unemployment ratio in Sindh was 25 percent during the 1980's but this figure jumped to 33 percent in the 1990s⁶. The ratio of economically active population to total population, termed as crude activity or participation rate, is around 22.75 percent in Sindh but the 1998 census reports a participation rate of 32.73 percent (age 10 and above). In either case, it is very low and indicates a high incidence of poverty.

Agriculture is the single largest sector of Pakistan's economy and accounts for 26 percent of the GDP, providing livelihood to 68 percent of the people living in rural areas. It employs about 46 percent of the labour force,

2. ADB, 2002; Social Development in Sindh
3. Pakistan National Human Development Report (NHDR) 2003
4. SPDC, 1998; Social Development in Pakistan
5. Ibid
6. Sabihuddin Ghousi, 50pc live below poverty line in Sindh, Dawn, EBR

and amounts for export earnings up to 60 percent of the total GNP. Since the economy of Sindh is largely agrarian (for details see Section "Sindh in the National Context" in Chapter 1), the economic development of the province depends largely on the development of its agricultural sector. Rural Sindh, in particular, has been hit hard by drought in the past four years and more than eight million people have been pushed below the poverty level. A study sponsored by the ADB showed that 82 percent of the population in the five districts of Sindh lives on an income of less than one dollar a day, which is the UN measure of poverty⁷.

Urban Sindh, which consists mainly of Karachi, Hyderabad, Sukkur, Nawabshah, Shikarpur and Larkana, comprises about 48 percent of the provincial population, is also showing a decline in economic growth. The services sector has shrunk sharply⁸. In addition, the urban areas of Sindh continue to receive an influx from Punjab and the NWFP leading to stress in the infrastructure and a further increase in the level of unemployment (for details see Chapter 15: Urbanisation and its Environmental Repercussions).

Employment opportunities in Karachi, Hyderabad, Sukkur and other urban areas of Sindh started declining in the 1990s as a result of a flight of capital and industry from the urban areas due to a serious law and order situation. In addition, since 1997, the government started privatising public owned enterprises and institutions as a result of which tens of thousands of jobs were lost. Persisting drought, crippling tax structures imposed under the influence of the IMF and World Bank reforms, fluctuations in the exchange value of the rupee, a breakdown of the infrastructure, and a failure to control lawlessness have all created a major economic recession⁹.

As part of a country facing the challenge of reviving economic growth and eliminating poverty, Sindh will need rapid development in agriculture, agro-based industries, small and medium industries, oil and gas exploration and the development of the IT sector at the

provincial and district levels. The strong potential to create jobs and self-employment needs to be explored. Growth has to be accompanied by measures that ensure social development which take into account economic, political and social dimensions.

SANITATION & WATER SUPPLY

In most urban areas, government supply of water and sanitation facilities have become inadequate due to natural growth of the population and migration from NWFP and the Punjab (see Chapter 15: Urbanisation and its Repercussions).

Only 10 percent of Sindh's rural population has access to potable water and only seven percent of the areas have drain coverage. Twenty six percent of the rural population in the province relies on a dug well, or a river, canal or stream for drinking water as opposed to a hand pump or a tap. This does not compare well with, for example, the Punjab where only six percent of the rural population relies on wells or surface water sources. Only 21.76 percent of Sindh's rural population has access to planned water supply schemes and most of them are not properly maintained.

There is thus a shortage of water in both rural and urban areas of Sindh for both drinking and irrigation purposes. In rural areas, drinking water is monopolised by the landlords and there is a shortage for irrigation which has affected many crop yields. Such controls adversely affect the lives of the poor.

Similarly, 58 percent of the households in Sindh do not have access to toilets and 87 percent do not have access to any sort of sanitation system, which makes Sindh rank second to Balochistan¹⁰. Rural sanitation coverage only amounts to 8.91 percent. These conditions adversely affect the health and well being of the local people.

7. Ibid

8. Ibid

9. Sabihuddin Ghausi, Sindh employment drops by 2.5, Dawn EBR

10. ADB, 2002; Social Development in Sindh



Ali Raza Rizvi

A stark reality: 50 percent of the population lives below the poverty line in Sindh

EDUCATIONAL ACHIEVEMENT INDICES

The level of human development in the province is currently very low and little improvement has taken place during the 1990's in the education and health sectors.

The link between education and poverty is well established in terms of schooling and achievement among low income families; primary school education effectiveness in improving school performance; high school graduation rates; and the relationship between school quality and adult economic achievement.

Against the total population of the primary school-going age group of 4,860 million, only 2.62 million children are enrolled in schools with a participation rate of 54 percent, which means that 46 percent, or 2.24 million children, are not attending school. Likewise, out of a population of 3.702 million of the middle-school-going age

group, only 3.118 million children attend Middle and Secondary Schools.

Out of 6.2 million children in the 4 - 9 years age group, only 3.1 million are enrolled in schools. In addition, there are poorly trained teachers, inadequate school supplies and poor infrastructure. Thirty five percent of elementary schools are shelterless and 55 percent are without water and sanitation facilities¹¹. There are also major differences in literacy rates between rural and urban areas whose details are given in tables 2 to 5 in **Appendix 3: Socio-Economic Data of Sindh**. It is important to note that female literacy in rural Sindh is only 12.23 against female literacy of 56.66 for the urban areas. These figures highlight not only the poor human development conditions in Sindh, but also the disparity between rural and urban areas, which creates two different scenarios within the same province.

There are about thirty-nine thousand primary schools in Sindh where two-and-a-half million children out of 4.6 million children of school going age are enrolled. Of these schools,

11. [http://nweb18.worldbank.org/sar/sa.nsf/Attachments/PDF2003-Sindh/\\$File/Sindh.pdf](http://nweb18.worldbank.org/sar/sa.nsf/Attachments/PDF2003-Sindh/$File/Sindh.pdf)

Table 20.1: Health Statistics, 1998

Doctors per 10 thousand persons	2.91
Nurses per 10 thousand persons	0.89
Beds in Hospitals per 10 thousand persons	7.76

Source: Sindh at a Glance, 2000

32,000 have no electricity which means that children have to sit in the heat during the summer. According to a recent newspaper article, there are 22,000 schools without water and 21,000 schools without toilet facilities.

HEALTH STATUS

Improvement in the health status of Sindh's population is one of the major factors that can contribute to poverty reduction. The existing health system has not provided adequate services to meet the requirement of the population owing to limited financial and human resources, poor management, absence of political will and appropriate policies. At present, 65 percent of the population is being provided health facilities, which may be only theoretical since many government facilities, especially in the rural areas, do not function and only 45 percent EPI coverage or less than five years are achieved. The child mortality rate and

maternal mortality rate are 109 per 1,000 live births compared to a national average of 103, and 553 per 100,000, as compared to a national average of 500 live births respectively¹².

The percentage of married women using family planning methods is only seven percent compared to a national average of 16 percent. Full immunisation coverage is 49 percent all over the country but only 47 percent in Sindh. There is also a serious shortage of paramedics and hospital beds as indicated in Table 20.1.

An ADB report on social development in Sindh¹³ gives details of conditions at various sites in the province. Some of their findings are given in Box 20.1: Health Facilities in Sindh.

As the result of an absence of cheap public sector health care facilities and poor environmental conditions related to water and sanitation, people are generally, in poor health. The school-going children do not have good

Box 20.1: Health Facilities in Sindh

In Baldia Town, (population over one million), Karachi, there is no government hospital. In Dadu, there are no government medical facilities. In Pachan Mori, Mirpurkhas District, there is a two-room dispensary built in 1985. There is no doctor available and a vet practices from the dispensary treating both animals and humans. The villagers say that no medicines are available from the dispensary.

In Kaasbo, one dispensary provides health facilities to the villagers but there is no doctor although there is one traditional birth attendant. In Malmari, Thatta, there is only one government dispensary located in the house of the midwife. In Bhudo Khan Khoso, there is, in theory, a government dispensary, and a Basic Health Unit except that neither of these facilities is operational. There are, instead, six private hospitals, which are unaffordable for the poorer sections of the population.

The only government programme that reaches the most remote villages is that of polio immunisation.

Source: Sindh Province Report, 2002, Pakistan Poverty Reduction Strategy

12. Government of Sindh, 2002; Pakistan Poverty Reduction Strategy Paper
13. ADB, 2002; Social Development in Sindh

attendance records and the adults tend to miss days of work. Many people have to raise money through loans to access health care, often having to travel to the cities. All this adds to debt, unemployment and poverty.

NATURAL RESOURCES

Poverty and environmental degradation although inextricably linked, their nexus is not the simplistic downward spiral that is commonly accepted. Poor people are not always the agents of environmental degradation, but more often than not, are its victims. Recent research has shown that misguided agricultural and trade policies and poor food distribution (and hence entitlement to food) may be the root causes of hunger and malnutrition, whereas rapid population growth magnifies bad policies (Merrick 2002).

Sindh's natural resources are under extreme stress. Environmental degradation due to their overuse is rapidly depleting them. In addition, waterlogging, salinity and pollution of water bodies due to an absence of the treatment of urban effluents and faulty development projects such as the LBOD and RBOD are depriving people of their means of livelihood. Shortage of water from the Indus has led to massive ecological damage to the Indus Delta, forcing the local population to move from their ancestral homes, and the loss of millions of acres of rich agricultural land to the sea. Shortage of Indus water has also adversely affected water availability for urban areas as much of Sindh's subsoil water aquifer is saline. Similarly, rangeland for animal production is being over-exploited due to an absence of alternative jobs and, in the process, is being turned into a desert. Marine life too is being depleted for the same reasons. These issues have been discussed at length in the chapters in Part 2 (The Green Sector).

In addition, there are major problems due to: the unequal distribution of private and public assets; relations between the federal and provincial governments; the absence of a political consensus on how the State is to be governed and the roles and responsibilities of the federating units in it; mismanagement; and

the absence of accountability and transparency in the functioning of government institutions.

All these constraints make the addressing of environmental issues difficult and degradation continues to pauperize people. The more they are impoverished, the more the environment comes under stress. Poverty is a part of this vicious circle and of the accompanying social and political problems which, in the absence of a larger political consensus in Pakistan in general and in Sindh in particular, are not being addressed.

POVERTY ALLEVIATION PROGRAMMES

The provincial government has initiated a comprehensive reform programme for the province aimed at alleviating poverty which is part of the government programme of fiscal restructuring, improving public service delivery, and regulatory reform. The government feels these will serve to accelerate human development and stimulate economic growth in the medium term. The key target indicators of the reform programme are consistent with the national targets of the Interim Poverty Reduction Strategy¹⁴.

PAKISTAN POVERTY REDUCTION STRATEGY PAPER (PPRSP)

The Poverty Reduction Strategy (2003-06) entails the following:

- A reduction in the population growth rate from 2.17 percent to 1.82 percent
- A reduction in unemployment and under-employment by creating jobs opportunities and providing technical training to the workforce
- An increase in the literacy rates, especially female literacy, in the rural areas

14. ADB, 2002, Social Development in Sindh

- An increase in the immunization of children up to five years of age from 45 percent to 80 percent
- A reduction in the child mortality rate from 111 to 77 per 1,000 live births
- A hundred percent eradication of polio
- A reduction in the prevalence of malnutrition among pre-school children from 40 percent to 35 percent
- An increase in water supply coverage to rural areas from 28 percent to 40 percent
- An increase in sanitation coverage from 29 percent to 31 percent of the population
- To explore and strengthen indigenous community and family support structures, including NGO's (mutual aid societies)¹⁵

The four elements of this poverty reduction strategy are:

- Engendering growth
- Creating income generating opportunities
- Improving social sector outcomes
- Reducing vulnerability to shocks

KHUSHHAL PAKISTAN PROGRAMME

The present government has launched this poverty alleviation programme in order to generate employment through public works on a provincial basis. The Khushhal Pakistan Programme (Phase- I, II, and III) is pitched at Rs. 5.5 billion. The schemes under this programme have been executed at the district level through active community participation. This programme has created 100,000 new employment opportunities and provided



Sana Raza

Slums built along train tracks in Karachi

essential infrastructure facilities to a population of 5,000,000 in rural and low-income urban areas¹⁶. So far, there has been no evaluation of the programme and press reports have doubts cast on its effectiveness and on whether there has been any community participation in it.

DROUGHT EMERGENCY RELIEF ASSISTANCE (DERA) PROGRAMME

This is a national programme with Rs. 300 million earmarked for the Provincial DERA Programme for the period of two years. Sindh's share of the funds is 30 percent. Thirteen districts, namely Karachi, Thatta, Badin, Tharparkar, Mirpurkhas, Sanghar, Khairpur, Sukkur, Ghotki, Shikarpur, Jacobabad, Larkana and Dadu, are included in this¹⁷.

15. Government of Sindh, 2002; Pakistan Poverty Reduction Strategy Paper

16. Ibid

17. Government of Sindh, 2002; Pakistan Poverty Reduction Strategy Paper

SECTORAL STRATEGIES

Sindh Rural Development Programme 2002

This loan programme, worth \$50 million USD is a flagship project which aims to initiate a development programme which targets the poorest of the poor in the four districts of Sanghar, Mirpurkhas, Badin and Thatta, where the problem of bonded labour is still prevalent. The overall goal is to reduce poverty in these regions by improving governance, providing access to public services, transferring technology for improved livelihoods and providing essential infrastructure¹⁸.

Decentralised School Improvement Project 2002

The objective of this programme, worth \$75 million USD, is to increase access to the pro-poor decentralised public elementary school system, with 60 percent beneficiaries being the rural poor¹⁹.

Access to Justice Programme

This programme supports the reform of the judiciary and the police service²⁰.

Agriculture Sector Programme Loan II

This programme will help small scale and marginal farmers improve productivity and profits by providing them with credit²¹.

Financial and Non-Bank Markets Governance Programme

This proposed programme focuses on improving corporate governance through a reform of the capital market and strengthening of the regulatory environment²². All these programmes have a major loan component (including the Khushal Pakistan Programme) from International Financial Institutions (IFI). There are people who argue that instead of alleviating poverty they will put Pakistan in greater debt, which is a major poverty indicator. There have been a number of such recommendations for poverty alleviation and their critique by civil society organisations in Sindh, one of which argues that an institutional rearrangement may be necessary for citizens to secure fundamental economic and social rights. This would mean giving specific organs of the State the authority to implement a comprehensive social contract envisaged by the Constitution; making public representatives accountable; and through judicial, administrative, and legislative backing of all legal and policy initiatives that directly or indirectly obstruct the realisation of fundamental economic and social rights. Forced labour in Sindh is a major obstacle to poverty reduction and the government has an obligation to eliminate this practice. For this, political devolution is required which goes beyond administrative decentralisation to local government²³.

ISSUES IN POVERTY REDUCTION: POLICY IMPLICATIONS

To devise a strategy for poverty reduction, the following factors have to be taken into account:

- **Poor people are angry:** There is a deep sense of deprivation, exploitation and helplessness pervasive amongst the poor in Sindh. This anger is on such a scale that

18. ADB, 2002; Social Development in Sindh

19. Ibid

20. Ibid

21. Ibid

22. Ibid

23. Ercelwan, Nauman. 2003. Poverty Reduction in Sindh

authorities would be advised not to ignore it.

- **The importance of natural resource management:** Since the poorest people heavily rely on natural assets, events and policies that destroy or degrade natural resources have a major impact on the poor. The policy implication is that a poverty reduction strategy must include effective measures for managing and preserving natural resources.
- **Inequality in the distribution of private assets:** The distribution of key private assets such as water and land is highly inequitable which is a fundamental reason for poverty. Poverty Reduction strategies should start by re-examining the lessons of previous land reforms in Sindh²⁴.
- **Inequality in the distribution of public assets:** Publicly provided assets which help build human capital, such as education and health facilities, are also distributed very unevenly with a large gap between what is supposed to be available and what is actually supplied. Policy makers should revisit past policies for improving social infrastructure such as the Social Action Programme and critically examine the reasons for their failure to deliver genuine improvements on a significant scale.

STAKEHOLDERS

Federal Government and Legislative Assemblies

The federal government is responsible for formulating policies and developing institutions that can generate employment; remove the enormous inequality in the distribution of private and public assets; improve natural resource management; and implement the comprehensive social contract as envisaged by the Constitution. This can only be done if the political parties represented in the National and Provincial Assemblies make it a part of their political agenda to reform, in particular, the police and the judicial system.

Provincial Government Institutions

Provincial government institutions that manage natural resources and development are important stakeholders. They need to establish coordination between themselves and to put in place better management and monitoring systems; closer interaction with communities and NGOs; transparency and accountability in their functioning; better access to justice for the poorer sections of the population; and an improved law and order situation.

Local Government

With the devolution plan, local governments have become major players in providing social and physical infrastructure. They are still weak and need to develop effective technical and managerial support systems, especially at the Union Council and *tehsil* level to prepare and manage developments being funded by the various poverty alleviation funds.

Academic Institutions

Academic institutions need to research into both the macro and micro level poverty related issues and make their findings available to all policymakers, local government, political parties, NGOs and communities.

NGOs

NGOs in Sindh are increasing, meeting the growing demand for social services. They have raised consciousness regarding rights and responsibilities, built capacities and skills in many communities and are also contributing to policy formation, planning and research.

Local Communities

Organised and well-informed communities are better equipped to make use of government poverty alleviation programmes. They also

24. PILER. 2003. Power, Politics and Poverty in Pakistan

have a far greater social mobility which improves their living conditions.

FUTURE ACTION

Social protection of vulnerable classes of people is a fundamental component of a strategy to reduce poverty. This implies that policies and strategies should be aimed at reducing the actual risk or probability of shock as a disruption in livelihood, mitigating the potential impact of shocks and the creation of an environment to strengthen livelihoods. Social protection includes the provision of the basic necessities, mainly food and water. The State needs to ensure the provision of food to the poor and the revival of ration cards that would at least ensure that daily calorie requirements can be met through subsidized food.

Poverty cannot be reduced in Sindh without stemming and reversing rural decline. The reasons for this decline are complex and

include widespread water shortage and deterioration in irrigation systems, reduced agricultural yields, depletion of livestock holdings, intensification of exploitation of the *hari* by landlords and a worsening law and order situation. Natural resource management ought to be improved and there should be the promotion of greater equity regarding the distribution of water. As for the deteriorating law and order, unless a bold vision is developed to address the problem, poverty in rural Sindh will continue to grow²⁵.

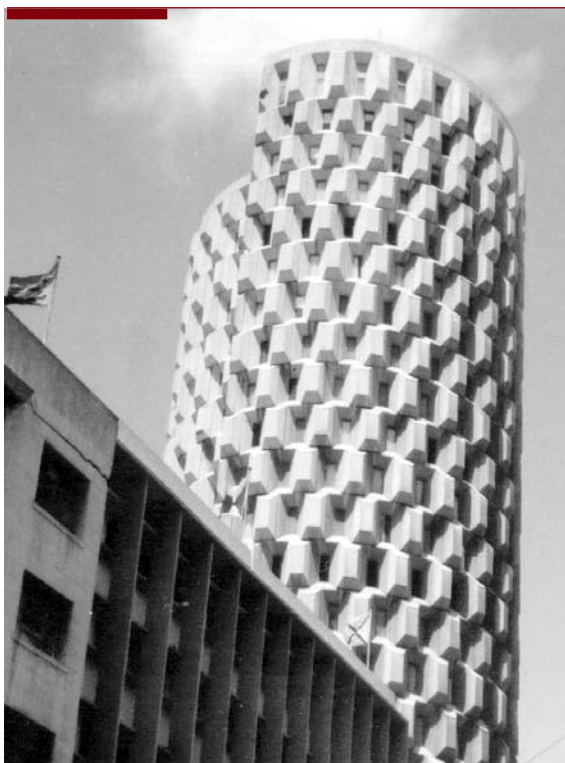
Another issue that needs to be addressed is the concentration of land ownership which affects local power relations. Through debt bondage and other instruments of control, the labour force is kept in a state of dependency. Land reforms are needed, which may be designed to eliminate large landholdings and the culture of feudalism in the country because without such reforms, development in Sindh is impossible.

Due to the power imbalance, exploitation of labour is not restricted to the rural areas. Competition for regular work in urban areas is intense and workers, especially women and migrants, are usually remunerated very poorly. Regulatory solutions to these problems need to be found, whereby labourers are paid market wages. Additionally, the contract system needs to be investigated for regulation²⁶.

Women are the main victims of poverty in Sindh. They are also exposed to the threat of feudal tradition such as honour killings and acid burning. Policy makers need to enforce strict laws and penalties for offenders.

Although Pakistan already has an institutional system for social protection (*zakat*), the money never reaches the poor. Suggestions were made that instead of giving *zakat* as money, food, clothes, and other tangible items should be given to reduce extortion .

Insecurity is a basic problem that aggravates poverty. Civil protection agencies, such as the police or Rangers should be made accountable for their acts and authority should be delegated to them only if they are paid market wages and



Mohammed Anees Shehzad

Habib Bank Plaza Near Tower, Karachi: Prosperity in larger cities

25. Ibid

26. Ibid

are kept under strict check. A major police reform is required.

Poverty reduction strategies need to account for official corruption, which is a deterrent to all reforms. Policies should be revisited and this issue must be dealt with. They also need to account for environmental degradation and effective natural resource management to reduce the element of shock to the poor.

And finally, the issues of poverty and their causes have to be made a part of a larger political debate without which the necessary social changes required to implement fundamental social and economic rights, as enshrined in the Constitution, cannot be achieved. Without these basic human rights, poverty cannot possibly be reduced effectively.



CHAPTER 21

Education



f all social indicators to gauge the dynamics of development in the province of Sindh, perhaps education is the most indicative of the commitments of public policy.

Literacy rates for both men and women have increased tremendously in the last ten years in the province, with the figures for Karachi being 71.7 percent for men and 71.4 percent for women. However, the disparity between metropolitan Karachi and the rest of Sindh has become all the more marked with the provincial average being 65.2 and the national average being 46.7 percent the rate of overall literacy¹. This broad aggregate can be further broken down into income group disparities. For instance, qualifications may be made in terms of public, private and madrassah schools, which may be still further divided into those opting for English, Urdu or Sindhi media of instruction. Even within English medium schools, those opting for Matriculation with the local board of education and those for the Cambridge examination system, tend to inhabit two different worlds. Thus the indices for education in the province cannot simply be read in terms of the availability of infrastructural facilities but need to be correlated to the mode and quality of instruction.

Although education was always a low priority for the federal and provincial governments with the amount earmarked for education decreasing each year even as the annual growth rates for the economy improved, a

disinvestment policy is evident from the 1990s when international donor agencies stepped in to promote an active public-private partnership. In 2001-2002, the amount of Rs. 1,150 million for education was reduced to Rs. 643 million by the provincial government². More recently, the federal Education Minister has gone so far as to state that the growing figures for literacy are largely a result of the private sector involvement in education³.

PRESENT SITUATION

The Public Sector Schools

International standards that compile the Education Performance Index for any region or country measure the figures for primary school enrolment, completion of schooling and the teacher-student ratio. On all these counts, Pakistan ranks 99 in a list of 144 countries, lower than all South Asian and North African states. See Table 21.1: Total Enrolment and Number of Public Schools in Sindh, 1998.

According to the latest census reports, 40 percent of the population of Pakistan is under

Table 21.1: Total Enrolment and Number of Public Schools in Sindh, 1998

	Total Enrolment	Total Schools
Primary schools	2,256,461	38,884
Middle schools	131,749	2,073
High schools	655,218	1,449

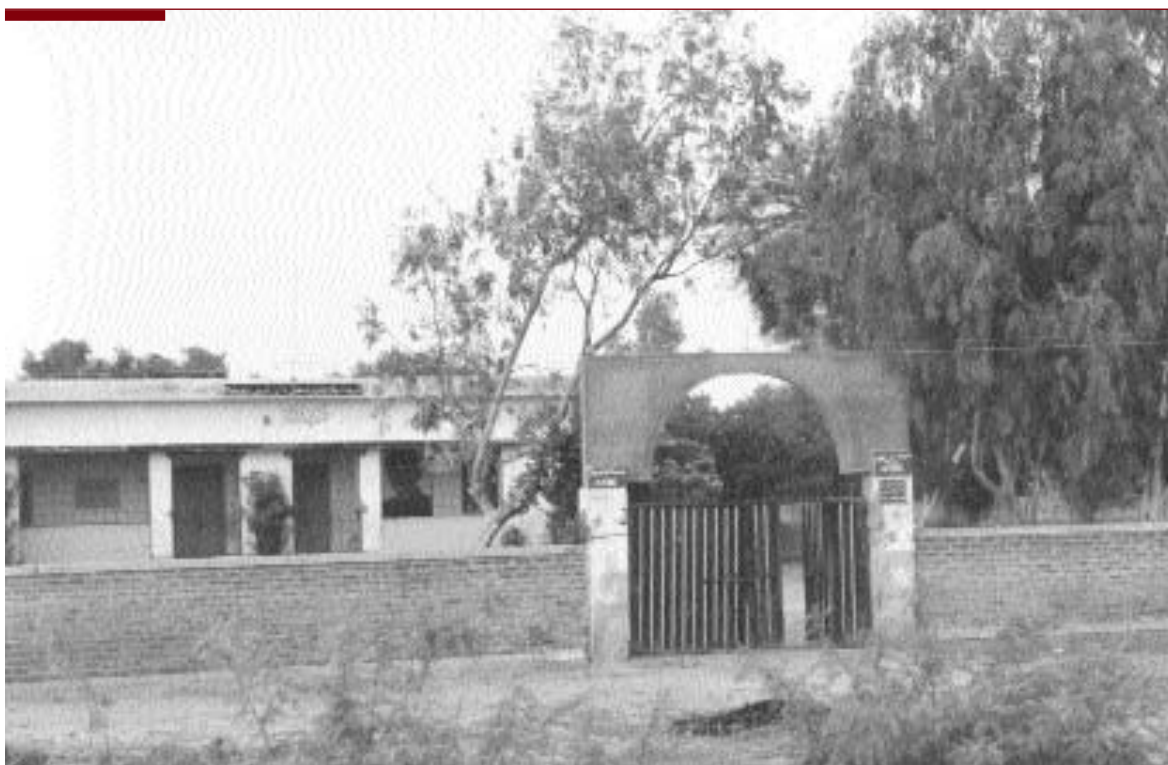
Source: Development Statistics of Sindh, 2001

Table 21.2: Enrolment Ratio, Primary, 1999

	Male	Female	Total
Sindh	58.2	35.2	47.2
Punjab	62.3	54.8	58.6
Balochistan	63.5	45	55.2
NWFP	64.5	47.7	56.4

Source: Development Statistics of Sindh, 2001

1. Social Development in Pakistan. 2001. Oxford University Press, Karachi
2. Development Statistics of Sindh. 2001
3. Dawn. 23 June 2003



A typical school building: Sindh has the lowest number of primary schools

18 years of age, of which 18 percent reside in Sindh. The state of public schools is evident from the fact that 30 percent of schools are without buildings, of the 38,885 public sector schools, 13,537 are without electricity, 5,901 without water, 12,791 without toilets and 1,131 without boundary walls. Even according to conservative estimates, Sindh has the largest number of 'ghost' schools in the country, which refers to schools that exist only on paper, with at least 700 'ghost' teachers of primary schools drawing government salaries⁴.

Within the country, Sindh has some of the worst indices for education, particularly in the small

towns and the rural areas. In 1999, at 47.2, Sindh has the lowest enrolment ratio for primary schooling in all the provinces, lower than even the most sparse and underdeveloped province of Balochistan. Table 21.2 shows the enrolment ratio for primary schooling in Sindh. The enrolment ratio measured as a percentage of population between 5-25 years for Balochistan is 55.2, for NWFP is 56.4, and for Punjab is 58.6, varying sharply across area and gender.

The student-teacher ratio for Sindh in 1999 is the worst too, falling behind by over 10 points as compared to all the other provinces as depicted in Table 21.3. Since 1975, the

Table 21.3: Teacher-Student Ratio, Primary, 1999 (in percentage)

	Male	Female	Total
Sindh	19.8	30.7	22.7
Punjab	32.1	40.1	35.3
Balochistan	32.9	44.6	36.4
NWFP	32.5	37.4	33.9

Source: Growth, Inequality and Poverty, SPDC, 2001

4. *The State of Education*, Social Policy Development Centre, Karachi. 2003

Table 21.4: Number of Private Institutions by Type and Level in Sindh, 1999-2000

	Total	Rural	Urban
Primary	2,572	577	1,995
Middle	1,741	99	1,642
High	1,495	34	1,461
High Secondary	87	3	84
Degree	23	1	22
University	22	1	21
Undergraduate	86	None	86
Graduate	42	6	36

Source: SPDC, Annual Report 2001

increasing imbalance between the teacher-student ratio in primary and secondary schools has led to overcrowded classrooms, falling standards of instruction and evaluation and greater drop-out rates. The poorly paid teachers have been demonstrating on the streets in different parts of rural Sindh and the smaller towns⁵.

This has adversely affected primary schooling in particular, since the teachers generally force the schools to shut down for long periods of time, a phenomenon that is discussed later in this chapter.

According to official surveys, Sindh has the lowest teacher-student ratio in all the provinces. The percentage of female teachers in secondary schools is also falling in Sindh and the Punjab, making the classrooms swell to sometimes 80 students.

The Private Sector Schools

While the provincial government has only recently announced its intention to make a detailed regularisation of private schools, there are, according to official estimates made in 1999, 36,096 private institutions all over Sindh, with 6,457 autonomous school systems and chains offering highly priced, qualitative instruction, mostly in the urban centres. In terms of general education up to higher secondary level, there are 5,943 private schools for the province, with 86 undergraduate professional or technical training colleges, and 42 professional or technical training institutions⁶. See Table 21.4: Number of Private Institutions by Type and Level in Sindh, 1999-2000.

Of private schools, only 48 schools have science and computer laboratories, only 36

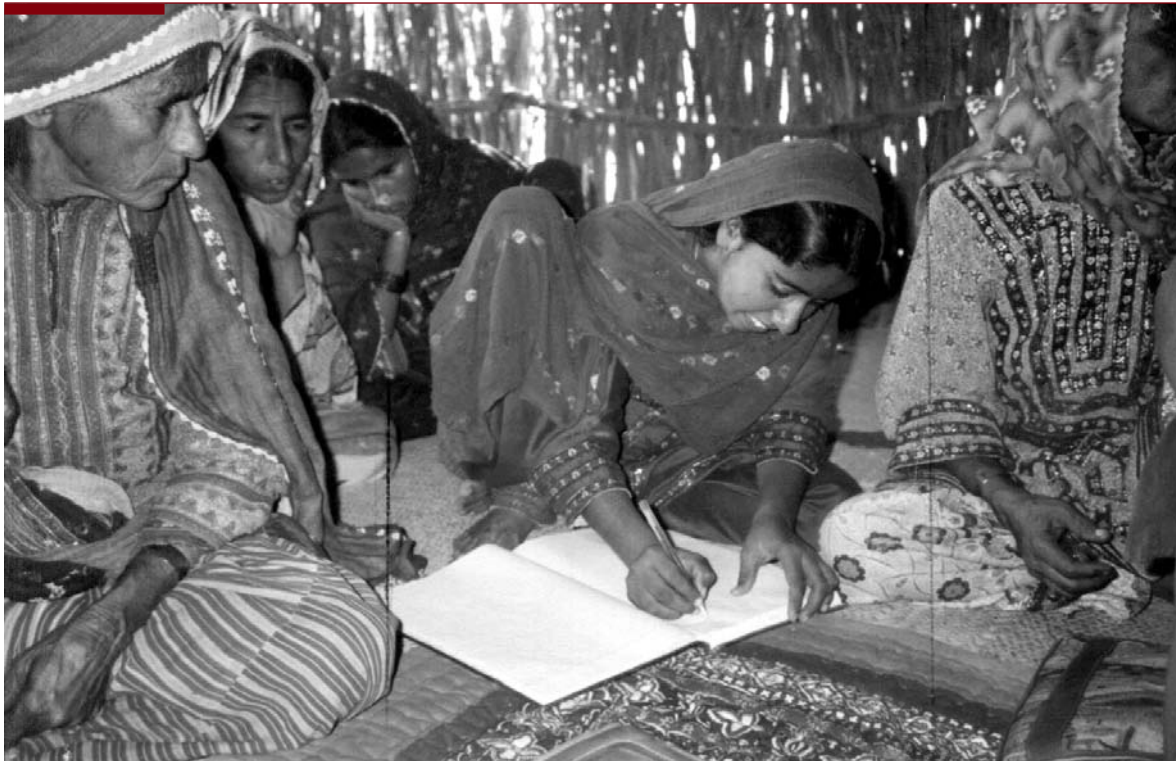
Table 21.5: Growth in the Number of Madrasahs

Name	1988	2002
Wafaqul-Madaris	1,779	7,000
Tanzim-ul Madaris	717	1,585
Wafaq-ul Madaras-al Salafia	161	376
Rabta Madaris al Islamia	97	500
Wafaqul Madaris	47	419
Total	2,801	9,880

Source: Central Board of Madrasahs, 2003

5. Hilal-e Pakistan, 22 October 2003

6. Annual Report. Social Policy Development Centre. 2001. SPDC



Girls School at 'Khuda Ki Basti': The number of these schools have increased in the last two decades

have playgrounds, 127 have libraries, 44 have an auditorium, 11 have hostel facility and 28 provide transport⁷.

For the current fiscal year, the government of Sindh has only 1,700 applications for the regularisation of private schools, since most such schools run outside the official ambit. The Education Ministry has suggested that legislation may be framed when a national curriculum and fee structure may be put on board. According to the Sindh Private Education Institutions Ordinance 2001, 40,000 teachers and 3,000 non-teaching staff of private institutions in Karachi, who may be hired for as little as Rs.1,000 per month with a Matriculation degree, have no job security.

There are two main examination systems, the Matriculation system and the Cambridge examination system. In addition, a private examination board has recently been introduced by the Aga Khan University.

The *Madrassah*

Religious schools, or the *Madrassahs*, have offered traditional education in the scriptures and have been preferred by the poor classes because they offer lodging and food to young boys. Supported by religious sects and parties and approved by the government, the number of these schools has increased phenomenally over the last two decades. See Table 21.5: Growth of the *Madrassah*. The increase has been such that it has caused international concern about where Pakistan's development priorities lie with the federal education minister being called upon for answers by the US government⁸.

According to the federal minister, there are 11,000 *Madrassahs* in the entire country catering to about 800,000 students, both male and female. In the annual budget for 2003-2004, a figure of Rs. 1 billion was earmarked to integrate *madrassahs* with mainstream general education by introducing textbooks on General Science, Math and English at the primary level

7. Ibid

8. *Dawn*, 12 July 2003

Box 21.1: Madrassah Curriculum

Syllabus of Wafaq-ul-Madaris Madrassah	
<p>1. Ibtidaiyah (Primary) <i>Noorani Qaidah</i> (Beginners' Textbook for Arabic Language) <i>Nazriah Qur'an Kareem</i> (Recitation of Qur'an) <i>Tajweed and Hafiz Part 30 Amma</i> (Correct Recitation of Qur'an, Memorization of Part 30 of Qur'an) Urdu Language Mathematics Social Sciences General Science Practical Crafts Islamiyat Physical Training Sindhi Language Government primary school curriculum</p>	<p>4. Thanawiahe-Khassah (Higher Secondary) <i>Tafseer-ul-Qur'an</i> Exegesis) <i>Hadith-e-Nabawi</i> <i>Fiqah</i> (Jurisprudence) <i>Usul-ul-Fiqah</i> (Principles of Jurisprudence) <i>Nahw</i> (Syntax) <i>Sarf</i> (Morphology) <i>Mantiq</i> (Logic) Arabic Literature</p>
<p>2. Mutawassitah (Middle) <i>Tajweed-al-Qur'an</i> (Correct Recitation of the Qur'an) <i>Hadr</i> (Rapid Recitation of the Qur'an) <i>Ilm-ul-Tajweed</i> (The science of Qur'anic Phonetics) Persian Language Good Handwriting (Calligraphy) <i>Aqa'id</i> (Beliefs) <i>Ibadaats</i> (Act of Worship) <i>Mu'alamat</i> (Business Practice Transactions) Morality and Character Social Sciences Urdu Language Mathematics Science English</p>	<p>5. Aaliyah (Bachelors) <i>Tafseer-ul-Quran</i> (Exegesis) <i>Hadith-e-Nabawillm-ul-Faraid</i> (Science of Inheritance) <i>Usul-ul-Fiqahllm-ul-Balaghah</i> (Rhetoric) Arabic Literature Logic Philosophy Arabic Composition <i>Ilm-ul-Jadi</i> (Munaziarah or Debate) <i>Ilm-ul-Kalam</i> (Scholastic) <i>Ilm-ul-Arud</i> (Prosody)</p>
<p>3. Thanawiyah-e-Aammah (Secondary) <i>Dars Nizami</i> <i>Qirr'ah</i> (Phonetically modulated recitation of the Qur'an) <i>Tafseer-al-Qur'an</i> (Exegesis) <i>Hadith Nabaw</i> (Sayings of the Holy Prophet) <i>Nahw</i> (Syntax) <i>Sarf</i> (Morphology) Arabic Literature <i>Fiqah</i> (Islamic Jurisprudence) <i>Mantiq</i> (Logic)</p>	<p>6. Aalemiyah (Masters) <i>Taseer -ul-Qur'an</i> (Exegesis) <i>Usul-ul-Tafseer</i> (Principles of Exegesis) <i>Ilm-ul-Hadith</i> (Knowledge of the sayings of Holy Prophet) <i>Usul-al-Hadith</i> (Principles of Hadith) <i>Fiqah</i> <i>Usul-al-Fiqah</i> <i>Ilm-ul-Kalam</i> (Scholastics) <i>Ilm-ul-Hai'at</i> (Astronomy) Islam Modern Economy and Business</p>

and Economics, Computer Science, and Pakistan Studies at the secondary level. Three-year financial support was offered by the government for *madrassahs* using this syllabus, inclusive of teacher training and infrastructure improvements such as libraries, laboratories, better textbooks, and better salaries to the staff. The aim is to eliminate sectarianism, and extremism from religious education.⁹

The *Madrassah* curriculum for primary to advanced level is decided by five boards corresponding to the Deobandi, Barelvi, Ahle Hadith, Jamat-i-Islami, and the Shia sects, which also collect registration fee and prepare examination papers. See Box 1: *Madrassah Curriculum*. The *Madrassahs* are well-organised institutions that not only offer a study of canonical texts but also critiques and interpretations according to the preference of the sects. The standards of teaching are higher than those for Urdu and for non-elite English medium schools.

Higher Education

In terms of graduate degree-awarding colleges, professional colleges, technical institutions and postgraduate studies, there has been no increase but an actual decrease in the number of functional institutions and in enrolment figures of students. The major reason for this is the emphasis on primary and secondary level education at the expense of the tertiary level. The provincial government has been absorbing budgetary cutbacks to education by decreasing subsidy for higher education. Table 21.6 depicts the number of public sector institutions, enrolment and teaching staff in the province.

There are only seven public universities in all of Sindh: Karachi University and NED Engineering University in Karachi; Sindh University, Mehran Engineering University, and Liaqat Medical College in Jamshoro; the Agricultural University in Tando Jam; Chandka Medical College in Larkana; Fatima Jinnah Girls Medical College in Nawabshah; and Khairpur University in Khairpur.

The private sector has stepped in with charters being given to Aga Khan Medical University,

Baqai Medical University, Sir Syed Engineering University, and Hamdard University. Some universities with foreign affiliations are also functioning but the University Grants Commission does not recognise them. Box 21.2 highlights all accredited universities and institutions in Sindh.

Increasingly, the government has been moving towards privatisation of higher education and the Task Force for Higher Education set up in early 2002 by the Department of Education to study the problems and suggest resolutions, came up with more such recommendations. It was held by the Task Force that public sector universities needed to increase admission, enrolment and examination fees and decrease the government subsidy. The teaching staff could be given short-term contractual appointments instead of permanent jobs where they were less motivated to perform their duties and the management of these institutions needed to be made more accountable and transparent. The Task Force also believed that research and development was beyond the ken of the present staff and students of public sector universities.



NED University, Karachi

9. Ibid

Box 21.2: Accredited Universities and Institutions in Sindh**Recognized universities and degree-awarding institutions in the public and private sectors****Karachi**

Iqra University
 University of Karachi
 DHA Suffa University
 Greenwich University
 Aga Khan University
 Hamdard University
 Baqai Medical University
 Ziauddin Medical
 University Textile Institute of Pakistan
 Pakistan Naval Academy
 Institute of Business Management
 Institute of Business Administration
 Muhammad Ali Jinnah University
 Fatima Jinnah University for Women
 Indus Valley School of Art & Architecture
 KASB Institute of Technology
 Karachi Institute of Economics & Technology
 NED University of Engineering & Technology
 Newport Institute of Communications & Economics
 Preston Institute of Management Science & Technology
 Shaheed Zulfikar Ali Bhutto Institute of Science & Technology
 Sir Syed University of Engineering & Technology

Jamshoro

University of Sindh
 Liaquat University of Medical & Health Sciences
 Mehran University of Engineering & Technology

NawabShah

Quaid-i-Awam University of Engineering, Sciences & Technology

Khairpur

Shah Abdul Latif University

Tandojam

Sindh Agriculture University

Hyderabad

Isra University

The HEC has also clarified that only the following institutions have been allowed to run degree-awarding programmes with foreign collaborations:

Karachi Institute of Information Technology with the collaboration of University of Huddersfield, England, which is an accredited university of UK.

Griffith College, Dublin, Karachi campus to run National Certificate/degree programmes of the National Council for Educational Awards, Ireland, under joint collaboration between the Academic Services Pakistan, Karachi and the Griffith College, Ireland.

Ziauddin Medical University, Karachi is running one year Master of Public Health degree programme in collaboration with Wollongong University, Australia.

Source: <http://www.dawn.com/2004/021/nat18.htm>

At least 300 members of the teaching staff of the Karachi University and the NED University of Engineering responded to the recommendations of the Task Force, rejecting its approach, content and its recommendations. They believed that the Task Force process was not consultative and under the ruse of increasing the autonomy of the institution, gradual privatisation was being encouraged as

an abdication of government responsibility. The staff suggested other measures, which included the revival of the Karachi Universities Act of 1974, the Senate, and the Syndicate. It also demanded for the Task Force to be immediately disbanded and its recommendations withdrawn.

As a result of the Task Force recommendations, the Higher Education Commission had proposed

an annual 15 percent increase in tuition fees for 2003-04 since the fee structure had not changed over the last five years. However, due to widespread opposition from students of the Sindh University, the proposition was withdrawn¹⁰.

There is acute paucity of technical and vocational training institutes. There has been very little growth in paramedical and para-engineering institutions from 1996-97 to date, with only two institutions being added to the aggregate over a period of four years. Most of them are located in urban centres and the enrolment in such schools has gone down from 22,817 students in 1996-1997 to 1,344 students in 1998-99.

Teacher training schools, too, show a similar trend. With only 2 institutes offering post graduate degrees, three graduate colleges and 26 colleges being below degree level, there has been not a single addition to the institutions over three years, from 1996 to 1999, while enrolment has gone down by almost 2,000 students for degree colleges and one thousand students for undergraduate teacher training colleges over a period of two years 1997-1999. However, refresher courses in teacher training are frequently offered by Provincial Institute of Teacher Education (PITE), Bureau of Curriculum, Government of Sindh, and private organisations such as AKU-IED and TRC, which is a positive trend.

Research Institutions

With a systematic degradation of public sector universities undertaken in the mid 1980s, all affiliated research institutions lost their independence and thereby the quality of research being undertaken. The vacuum thus created has been filled up by private sector research and development institutions often affiliated to NGOs but increasingly narrow in focus and thematic. Some excellent work has started emerging from this small private enterprise, particularly in Karachi where a number of such institutions are now based.

Such research institutions include those based on the natural sciences and those focusing on more social issues.

In Karachi, some of these include: the HEJ Centre for research based in Karachi University; the Applied Economics Research Centre also at the KU; and private sector research organisations like the Social Policy Development Centre, the Urban Resource Centre, the ZSABIST Centre for Research and AKU University Research Council.

Foreign Donor Agencies in the Public Sector

A number of foreign donor agencies have been operating in Pakistan since 1947, but in the last decade their numbers have multiplied. Although it is mandatory for donor agencies to work with the federal Education Ministry, donors prefer to work through organisations like the British Council and the Aga Khan University for reasons of efficiency and accountability. In November 1999, all foreign donor agencies, including the World Bank, suspended direct aid to education in Sindh. This funding has been resumed.

The World Bank, the Asian Development Bank, UNICEF, UNESCO, the Canadian-based CIDA, UK-based Department for International Development, Royal Netherlands Embassy, Norwegian-based NORAD and USAID are all major participants in public sector education and its ancillary programmes. Over the last three years, USAID has been the most active player in primary schooling projects that include capacity building of the teachers. ADB, too, has over some years, concentrated on teacher training programmes, while CIDA has been involved in the development of alternate history textbooks and English language teaching aids sensitive to gender and human rights. The DFID and RNE have redirected their concerns to influencing policy makers; NORAD is interested in funding research on educational issues, while UNESCO is currently looking at gender sensitive pedagogy.

Owing to a lack of government planning, donors tend to work on their own agendas with little or no coordination with either the local government or with each other. Their impact is therefore limited, ad hoc, and with little influence on public policy.

10. Hilal-e-Pakistan, 22 December 2003

Non-formal Education

In Pakistan, there is a significant percentage of the population that does not have access to formal educational channels. The rising population pressure and the inability of the formal education sector to keep pace with it further compound the problem. In order to increase the literacy rate and provide everyone with the opportunity to acquire at least basic education, the importance of adult and non-formal education has been recognized. The National Education Policy, 1998-2010 places high emphasis on the promotion of adult and non-formal education through community involvement as a means of achieving Universal Primary Education (UPE).

There are 711 non-formal schools in Sindh, according to the Sindh Education Department www.sindhedu.gov.pk imparting education to 39,651 students, of which 48.7% are boys and 51.3% are girls. These non-formal schools run under the supervision of NGOs or other organisations located in the same district, e.g. the Sindh Development Society, Hyderabad has been allocated 26 non-formal schools in Hyderabad. To enhance their skills, the teachers of the NFBE Schools are encouraged to take up the Certificate of Teaching (CT) and Primary Teachers Certificate (PTC) courses of the AIOU through distance learning.

Given the low rates of literacy in Pakistan, informal education remains a vital component of any strategy for environmental education and awareness.

Teacher Training

The NCS policy regarding training is to "Invest in specialized programs to develop training expertise in key areas capable of incorporating sustainable development in all areas of national activity." In 1993, the need to train teachers in environmental issues at the pre-service level was recognized by the Curriculum Wing at the Federal Ministry of Education in Islamabad.

Sindh has a number of teacher training institutes at the primary, secondary and tertiary

levels. Some of the important ones are Provincial Institute for Teacher Education (PITE), Aga Khan University – Institute for Educational Development (AKU-IED), Teachers Development Centre, Hamdard Institute for Education and Social Sciences, Teachers Resource Centre (TRC), iEARN, Family Education Service Foundation, NGO Resource Centre (NGORC), St. Patrick's College of Elementary Education, and Notredam Teacher Training College. There are also 27 Government Elementary colleges, 2 B.Ed. colleges and many Montessori training institutes in the province.

Environmental Education

The formalised term environmental education (EE) is relatively new in Pakistan, but its informal teaching by way of folklore, cultural traditions and religious values has always been a part of society. Also, the school curriculum includes courses and lectures on health, hygiene, and civic education, which have environmental relevance. Furthermore, different topics related to the environment have always been a part of subjects like science, geography, the social sciences and languages. However, environmental education has yet to be formally integrated or infused into the curriculum, even though general science, language and social science textbooks in all primary and secondary classes do contain topics on environmental issues.

While, at present, there is no national strategy for environmental education, the National Conservation Strategy does emphasise Environmental Education (EE) as a priority area, and has played an important role in bringing Environmental Education to the forefront. Henceforth, each of the sub-national conservation strategies also contains a separate section on environmental awareness and education. The prime, though not the only, target groups for these strategies being the education sector.

Even so, there have been no specific allocations for EE at the government level so far. In the Eighth Five-Year Plan, (1993-98), a separate provision for environment was made

for the first time. This amounted to Rs. 3.53 billion, or 0.5% of the federal budget¹¹.

Most of the activity in the area of EE is being handled by NGOs, and budgets are allocated on a project to project basis. The NCS Unit in the Ministry of Environment has an NGO Fund for environmental projects of non-profit organisations. Under this fund, proposals can be submitted for environmental education projects. However, most of the NGO activities are funded by foreign donors.

The organisations that have played an important role in promoting environmental education and awareness raising in Sindh in the formal and non formal sectors include WWF Pakistan, IUCN Pakistan, Teachers' Resource Centre (TRC), *Shehri*, *Shirkat Gah*, and Environmental Protection Agency (EPA), among others. Their work stretches from advocacy and policy making for environmental education to capacity building of teachers, curriculum developers, community organisers and activities for school children such as carnivals, puppet shows and walks and awareness-raising of the general public.

WWF Pakistan is involved in various activities for schools such as nature carnivals, various competitions for children, nature walks, puppet shows and training of teachers. The Education Programme of IUCN Pakistan works on policy making and institutional strengthening for environment with a focus on training of teachers, curriculum developers, textbook writers and community organisers and also works on the development of material including guidebooks, manuals and website for these stakeholders. TRC is involved in organising teacher training and dissemination of material for schools on environment. *Shehri and Shirkat Gah* are involved in conducting events such as seminars, workshops, discussions / debates, walks and environmental fairs for various stakeholders.

Privately owned educational institutions have also been quite actively involved in environmental education. Most of them use textbooks prepared abroad and are able to carry out environmental activities. Yet, there is a

need for EE to be formally incorporated into the curriculum in a systematic manner.

On the initiative of the Federal Ministry of Environment, the NCS Unit set up several hundred environmental clubs all over the country in early 1996. Their objective was to educate students about the importance of the environment, the problems associated with it, and the loss of biodiversity. However, due to a lack of funding and training of teachers, most of these clubs are not functional at present.

Though there are only a few places in Pakistan where university level courses are being offered on EE at present, such as AKU-IED in Karachi and Institute for Education Research (IER) at Peshawar University, there is a wide variety of environmentally relevant courses at both the Bachelors and Masters levels at various universities. Some teacher training institutes, such as TRC offer refresher courses in environmental education.

EMERGING ISSUES

Without a national vision for the future whereby it is determined whether Pakistan is to develop as an agrarian economy which is the fiefdom of the few, or if it is to step into and become part of the international market economy, the priorities in terms of how its people are going to be educated cannot be determined.

Income Inequity

At present, the highly inequitable system is built on income disparity which means that better education can only be purchased at a very high price from the market. Income determines if a child attends an English medium or an Urdu medium school and the different mindsets that these schools determine. Even within English medium schools, income determines whether a child is subjected to the outmoded Matriculation system based on poorly developed curricula and badly paid teaching staff, or if he or she can sit for the Cambridge examination system in privately owned tuition centres that provide access to the testing authorities in the UK.

11. Government of Pakistan. 1997. 50 Years of Pakistan in Statistics. Statistics Division, Islamabad

High Dropout Rates

As a developing country, the government has over-emphasised primary level schooling that does not go into middle schools where a high drop out rate is observed. This misplaced emphasis is producing half literate and very frustrated young men and women and also adds to the cost of middle and tertiary level schooling. With an increase in levels of poverty over the last decade, children drop out of school to help their families by engaging in economic activity. A considerable percentage of girls do not attend school because of lack of parental permission.

Social Attitudes

The high level of drop outs from secondary schooling and the gender gap in the education of women reflects prevalent social attitudes. Based on ignorance, low income families tend to keep children from school, not realising that this increases their poverty due to lack of opportunities. Related studies have proved that infant mortality and children's health is related to the mother's education.

In small and medium towns, in particular, and in rural areas, education is further discouraged by the large landholders who provide employment to the local people. This is because it is feared that the local people may begin to question their subaltern position.

By gradually making matriculation mandatory for all, the federal government can help change these attitudes.

Ghost Schools

In Karachi alone, 700 ghost schools have been identified by the authorities, referring to institutions that only exist on paper. The Sindh Education Department established a task force in January 1999 to identify such schools and the absentee staff that has been illegally appointed to draw government salaries. The Department identified 9 percent of schools all over Sindh and 7 percent of teachers but this is believed to be

an erroneous estimate. Even according to newspaper reports of the month of December 2003, 2004 primary schools were closed down by protesting teachers in Nawabshah, of which 156 were boy's schools, and 48 girl's schools. In Nasirabad, all primary schools were closed down for two months by the government staff; in Ghotki *tehsil* 54 primary schools were closed, in Dherki 48 schools, in Khanpur Meher 18, in Mirpur Mathelo 60, and in Obaru 65 schools were closed for over two months. In Ghotki alone, 15, 000 students were affected. In Larkana district, middle schools were closed for non-payment of salaries to teachers¹².

Curriculum Development

Curriculum development for public, private and *madrassah* education is essential to emphasise some core values in the younger generation. An over emphasis on 'Pakistan ideology' and 'Islamic polity' is meaningless at the school level where learning has to correspond to the growing needs of the mind. The desire to broaden a child's perspective may be achieved through a study of the social sciences, literatures of the world and international geography which are subjects that have been eliminated in the last two decades from school curricula. Sub-continental and world histories need to be compiled more carefully without editing out the non-Muslim world or the non-Muslim past of the subcontinent. Also needed is an emphasis on social and environmental issues. The current curricula do not contain much information on environmental education, There need sustainable development, or issues of environmental degradation, human rights, health and population, These need to be added to ensure that knowledge and respect for the environment and society are inculcated from childhood. The *madrassahs* can be employed as a good source for raising awareness on environmental issues as both environmental education and religious education promote ethics and values.

Examination System

The examination system needs to be overhauled with a change in pedagogical

12. Hilal-e Pakistan, 22 December 2003

methods. Instead of rote learning, systematic organisation of information and analytical skills need to be developed in keeping with the changing needs of the growing child. In Sindh, education standards have been falling consistently because the pass percentage keeps coming down. A recent example is when the Sindh Education Department decided to award grace marks to Matriculation and intermediate failures for the years 1999-2000 which was reported in the local press under the title, 'Rewarding Failure', Dawn, August 2003.

Teaching the Vernacular

National cohesion may be better served by a vernacular language being taught in school in all the provinces to teach children respect for cultural difference. While this is done in Sindh, it is generally resented by non-Sindhi speaking residents who consider it a waste of time for their children. Balochi, Brahvi, Punjabi, and Seraiki may also be introduced with their rich classical poetic traditions so that the learning of Sindhi does not remain confined to a sub-nationalist agenda. Box 2 describes Sindhi Medium schools. Teaching of environmental and social issues can be more effective if taught in the vernacular. There is a lot of folklore and indigenous information regarding nature conservation and environmental issues, which if taught in the vernacular, would be easily assimilated by the students.

Teacher Training

For the best and quickest changes to the present situation, teacher training is imperative. A number of NGOs funded by foreign donor agencies have been concentrating on such human resource development, but their interests are short term and donor driven. The government needs to take an active interest in evaluating and planning all such efforts, whether locally generated or through foreign funding. Often, female teachers are unable to avail of training opportunities and programmes have to be designed to transport and house women teachers so that they may have the least social barriers to overcome.

Most of the teachers training programmes focus on methods and techniques of teaching, which on one hand may improve the way teachers teach but on the other hand, restrict their teaching to improving methodologies. Very few training programmes concentrate on recuperating conceptual understanding of teachers especially their subject knowledge in the social and cultural context in which they operate. Therefore, integration of aspects such as environmental education, human rights, population and health education into the curriculum and teaching plans does not assure their teaching in a meaningful manner. It is therefore imperative to critically analyse the teacher training programmes and reorient them to address the above concerns.

Social Science Education

While everyone understands the value of teaching the natural sciences and modern technology for developmental purposes, what is often undervalued is the need to develop the social sciences in the province and in the country. For South Asian societies in transition, it is critical to develop indigenous perspectives on history, governance, environment and natural sciences, colonial modernity and development, cultural priorities and new visions, where analytical skills enrich the understanding and are geared towards problem resolution.

Education for Sustainable Development

Since the Rio Earth Summit in 1992 and the World Summit on Sustainable Development (WSSD) in 2002, the dimension of sustainable development has been added to the global environment movement. The concept of EE was broadened to Education for Sustainable Development (ESD) through the inclusion of socioeconomic and political perspectives. ESD aims for inclusive education that focuses on equity, justice, democracy, respect and peace to empower people for making sound decisions for a sustainable future. It highlights the importance of developing closer links between environmental quality, human equality, human

Box 21.3: Sindhi Medium Schools

A phenomenon unique to the province of Sindh since before 1947, vernacular schools are the norm for primary schooling in all small towns and villages, excepting Karachi and its adjoining village communities.

Generally confined to lower income households, these schools are located close to home, sometimes utilising the mosque for daytime schooling. Their prime users are children from Sindhi speaking households. This does not include Sindhi speaking Baloch, southern Punjabis, or other migrants.

Beginning from class 1 to class 5, there is a Sindhi curriculum for math, science and social studies devised by the Sindh Textbook Board in Jamshoro. Urdu is introduced as a second language in a simplified form. After the primary level, the children are taught English as a language and a number of other subjects in that language. The entire staff of Sindhi medium schools comprises native speakers.

According to unofficial estimates, Sindhi medium primary schools that are not 'ghost' schools, have the least number of dropouts.

Vernacular schools at the primary level are an idea that has not been incorporated in other provinces of Pakistan. According to a number of pedagogues, children learn best in the language spoken by their families, provided they are gradually introduced to other languages that may be *lingua franca*. Pedagogic examples may be found in India and China, two large multi ethnic countries that have developed regional languages, complete with grammar and script. School children are taught in their vernacular in both these countries, with English taught in India for general communication and Mandarin taught in China for the same purpose.

There is a need to undertake an evaluation of Sindhi medium schools and to consider how their standards may be raised. What also needs to be studied is whether they may be considered a viable supplement to Urdu or English medium institutions. Such a study may help determine the future path for public education in other provinces of Pakistan.

rights, peace and their underlying political threads.

The UN has declared 2005-2014 as the decade for promoting ESD. This brings extensive opportunities for Pakistan. It has become essential to develop a holistic national programme for education that is grounded in the principles of sustainable development and is developed through wide stakeholder participation. The components of the strategy should reflect the government's commitment to develop national plans that integrate ESD in all sectors of society.

Involvement of Universities

Overall, the universities need to be integrated into the education system in terms of developing the curricula and the criteria for examinations to primary and secondary schools as is the practice in Europe where Cambridge, Oxford, and London Universities are engaged in public schooling.

STAKEHOLDERS

1. Children who are in need of education
2. Parents who plan a future for their offspring and provide the financial support for at least twelve years of schooling
3. Pedagogues of both public and private sector institutions
4. Researchers and scholars both within the country and abroad
5. The military establishment which also runs a number of educational institutions from primary level to professional and cadet colleges
6. Education entrepreneurs of large school chains and neighbourhood schools
7. The religious political groups and parties who run the *Madrasah*

8. The Federal Ministry of Education for the kind of policy it wishes to develop in the country
9. The Provincial Education Department with its textbook boards and its examination centres
10. General citizenry, even those without school-going children, who are concerned about the future direction of the country
11. International donor agencies from Euro-American countries that wish to see Pakistan develop as a moderate Muslim country

FUTURE ACTION

With the burden of financing the federal fiscal deficit shifted to the provinces, about 50 percent fell to Sindh province. Macroeconomic stabilisation has led to budgetary cutbacks to the human development sector, particularly health and education, so that national expenditure on education increased by only 1 percent over 1997-2000.

Meanwhile, the ground reality is that the public sector still remains the largest provider of subsidized education to about 70 percent of the population of Sindh. For this reason, the government cannot abdicate its responsibility to the people. Even with resource constraints, the provincial authorities need to direct all privatization efforts and donor-driven programmes concerned with education.

Without a national vision to bring down the chronic poverty indices, productivity cannot be increased nationally. It would be a mistaken investment in the future if the government continues to rely on private entrepreneurs in education because greater commodification through private investment is not likely to improve either the quantity or the quality of educational infrastructure.

While, at present, there is no national EE strategy, it is recognised as “the most important way of changing attitudes, so that people learn to accept responsibility for their own actions in relation to the environment”(Pakistan National Conservation Strategy). Therefore, there is a need to focus on conservation and sustainable development in the entire system of formal education with an aim to instil an ethic of conservation.

There is a need to develop a national EE and ESD strategy based on the guidelines provided in the NCS. Sustainable development and environmental ethics need to be incorporated into the educational system and curricula at all levels of formal, nonformal and informal education. EE and ESD should include ethical aspects of the people-environment relationship and the society- environment - economics nexus.


Education on sustainable development should grow from within the existing system rather than be added to it. This means that it should become a part of the education system at primary, secondary and tertiary levels. This can be achieved simultaneously with the revision and updation of curricula, whereby it can be ensured that environment conservation principles and approaches are incorporated into the curriculum and teaching programmes at all levels. At the primary, secondary and tertiary levels, environmental themes need to be infused into all the existing subjects. and specialized subjects should be introduced at the tertiary level. Furthermore, development of environmental educators and professionals through national, provincial and local training programs should be another priority area.

Comprehensive non-formal education programs should be launched to reach that large segment of population not now reached by education because of either poor access or literacy problems. The *ulema* and *madrassahs* should be involved and their capacity raised so that environmental education can also become part of their curriculum.



CHAPTER 22

Communication and Knowledge Management



The situation of the media in the province of Sindh, as in the entire country, presents an often contradictory and sometimes confusing picture. While media freedoms and opportunities, particularly in the electronic media, have expanded considerably in the last few years as a result of technological progress and governmental

liberalisation, countervailing economic, social and administrative pressures are simultaneously working to restrict the benefits of these freedoms and opportunities.

Media production and consumption is primarily an urban phenomenon and, as the most urbanised of Pakistan's provinces, Sindh is both the greatest beneficiary of expansions in media opportunities and the most affected by factors that curtail them. In particular, Sindh and Pakistan's commercial capital, Karachi, which has long been the hub of most print and electronic media production in the country, has been a magnet for the establishment of new media ventures. However, since the centre, which has shown schizophrenic fitfulness in its support for liberalisation, still primarily controls media policies the results of this glasnost are yet to be fully realised. The wide disparities between the urban and rural areas of Sindh which impact access to the media are also a major issue for the province, as are increasing corporate influence and control over media programming and media production.

PRINT MEDIA

Sindh is home to the most influential print media establishments in Pakistan. The largest English-language publications and the Urdu-language publications with the highest

circulation are based in Karachi. In addition, many multi-city newspapers are also headquartered in Karachi. Unlike the rest of Pakistan, the province also has a flourishing regional-language print media. In fact, Sindhi language newspapers hold a near monopoly over circulation in the interior of the province with extremely efficient market penetration. In terms of sheer numbers of titles published in various languages, Sindh is also the leader in the country. A list of Sindh based print media publications is given in **Appendix 22.1: Sindh Based Print Media Publications**.

The print media's greatest handicap is the low level of literacy throughout Pakistan. This handicap is particularly acute in the case of the rural areas of Sindh where access to newspapers and periodicals is limited by the distribution reach of publishing houses based in the urban centres. Another major factor affecting readership is the high cost of production that puts printed material outside the economic reach of a large sector of society. The main factor in the cost of production is the cost of paper products such as newsprint, which is imported. The price of newspapers and periodicals has gone upwards dramatically in



Sana Raza

A newspaper stall: Sindh is home to the largest number of Urdu and English publications

the last decade, forcing people to cut down on the number of newspapers and periodicals they purchase. The average price of an Urdu or Sindhi newspaper is now around Rs. six to seven daily, whereas English newspapers cost more than Rs.10 daily. Periodicals usually cost around Rs. 80 -100 monthly. These are substantial amounts for households where the average monthly income is below Rs. 2,500 and especially so for daily wage earners.

Freedom of Expression

The general perception within publishing circles is that the degree of freedom of expression available to the print media is unprecedented in Pakistan's history. While true on the whole, the discussion of some key issues and topics such as the role of the military in political affairs continue to be circumscribed by the self-censorship of publishers and journalists. Since publication houses often have other business interests that can be threatened, it is often easy for the government to influence coverage. And while officially denied, there continue to be instances of administrative pressure brought to bear on publications and journalists who go against the official line. A number of means are employed to put pressure on the print media that include 'press advice', economic threats such as the withdrawal of government advertisements and direct harassment of reporters and editors. This is particularly acute in cases where government projects with substantial financial implications are equated with 'national interests' that, in the view of the government, should not be questioned.

In addition, militant, political, religious and social groups often tend to exert their own pressures on journalists and publishing houses. A general lack of security within the province and the rise of vigilantism have encouraged this trend. Journalists have been threatened for exposing corruption or for reportage that goes against such groups. In extreme cases, publishing houses have been attacked and burnt and, as in two recent cases in rural Sindh, powerful tribal groups have killed journalists.

Access to Information and Government-Press Relations

The government has introduced measures to make access to information easier, including a plan to make government policies and statistical figures available on the internet. However, access to information is still severely restricted despite the introduction by the government of an ordinance. The bureaucratic procedures involved in formal requests by a citizen to access information are a long-drawn-out process with no guarantees of success.

The print media is now faced with a new defamation law that makes it easier to sue publications. The press is concerned that the motivation behind the introduction of this law is to curtail press freedom. It is resisting the formation of government-backed Press Councils which do not include journalists and have the power to adjudicate matters relating to complaints against the press. Sindh being the most urbanised of provinces with the largest number of publications in the country, will be the most affected by these government policies and laws.

Focus on Development Issues

Outside niche periodicals with limited circulation, the preponderance of political reportage in newspapers and news periodicals throughout the country has little room for social issues and topics such as the environment. Literary and story digests, which sometimes have large circulation figures, carry nothing except fiction and poetry. However, there has been a steady increase in the coverage given to environmental concerns in the print media over the years since they have increasingly become mainstream issues. One obvious example is the coverage given to the debate over large dams, centred around the controversy surrounding the Kalabagh Dam, where the involvement of political parties has given a bias to the reportage. In addition, the press has also covered the water crisis and its repercussions for Sindh and raised people's awareness regarding the issue. Major disasters such as the oil spill near Karachi Port have also galvanised coverage of environmental matters. Access to

informed writers on environmental issues is a major problem for most mainstream publications. However, where they have received some support from NGOs and experts, for example, in the case of one Sindhi daily, they have been able to dedicate up to a whole weekly page to such matters. The general perception remains, however, that writing on development and the environment is often too full of jargon and not of interest to the lay reader.

ELECTRONIC MEDIA

Television and Cable

Television viewers have increased tremendously in Sindh over the last few years. This has been affected both by the increase in the number of television sets owned as well as by the choice of programming available to viewers through satellite, cable and VCRs. According to the Government of Sindh statistics, over 900,000 television sets were owned by the residents of the province in June 1999 but, this may be a severe underestimation, since a large number of people do not purchase the requisite television licenses on which these numbers are based. According to government of Sindh sources, there were 28.29 television sets per thousand households in 1970 -71. In 1998 - 99, this figure had increased to 179.36.

At present, Pakistan Television has a major station in Karachi with transmitters throughout Sindh that provide coverage to almost all the province. Satellite dishes and formal and informal cable networks allow access to a variety of regional channels even in the most remote parts of the province.

By far, the greatest change in the media has come with the recent launching of a number of new locally-owned satellite television channels and the spread of cable coverage, beaming channels from around the world, especially in the urban centres. With the low levels of literacy in the province, television has always played an important part in reaching out to audiences. Television dramas and public service messages have been extremely useful in shaping public

opinion on social issues. However, the monopoly of the state-controlled Pakistan Television and its lack of credibility often limits its usefulness as an independent source of information. The advent of new privately-owned channels, often beaming 24-hour news from outside Pakistan's borders because of governmental restrictions, has changed this scenario drastically.

In March 2002, the government established the Pakistan Electronic Media Regulatory Authority (PEMRA) to bring the private sector formally into the field of electronic media for the first time in the country's history. For details, see **Appendix 22.2: The Role of PEMRA**. By this time, some entrepreneurs had already established local television stations which were being beamed directly via satellite from outside Pakistan to circumvent the legalities. Since then, a number of Pakistani-owned private channels, by current count at least nine separate channels including a Sindhi language channel, have been launched from Dubai, Hong Kong and London and more are on their way. Most of them have their headquarters in Karachi. Meanwhile, Pakistan Television has also expanded its channels to four including a recently launched "regional" channel which offers programming in provincial languages. Despite asking for bids for the establishment of satellite uplinking facilities and indicating an intention to do so for terrestrial channels, PEMRA has so far not issued any licenses. It is expected that the allowing of uplinking facilities within Pakistan and terrestrial channels will infuse new life into Pakistani television channels, most of which will be Sindh-based, since it will mean a reduction in the costs of operations.

The growth of television viewers has been significantly fuelled by the growth of cable networks which have brought down the cost of accessing satellite-based and subscription-based channels. Here again, PEMRA served mainly to formalise and legalise a phenomenon that was already underway in most urban centres of the country. PEMRA approved channels number only 54, while many cable companies continue to flout their guidelines. In low-income and rural areas, illegal cable systems also continue to exist and expand. According to PEMRA sources, there were 284



KTN

KTN News studio: First Sindhi language TV channel

licensed cable operators in Karachi and an additional 141 in the rest of Sindh.

Recently, licenses for using Multi-point Microwave Distribution System (MMDS) technology for 'wireless cable' have been issued to one company for Hyderabad, Sukkur, Nawabshah and Larkana. MMDS technology is particularly useful for rural areas where the cost of laying physical cables may be uneconomical.

Some of the new channels have already captured significant viewers, especially in the urban areas because of their 24 hour news function and their less stringent censorship rules. While Pakistan Television, with its gargantuan resources and already established infrastructure, continues to command the largest market share, the trends are towards an increasing fragmentation of viewers.

All of this points to a boon for independent television producers who now have more opportunities for making and selling television software. Twenty four hour television channels have a large appetite for programming. The number of independent investors, production

houses offering services and television producers has increased considerably in the last few years. However, there are problems for software producers and audiences. The kind of programming required by new channels has become limited to endless revenue earning family soaps, situational comedies (sitcoms), and celebrity-laden gala shows. Even so serious or innovative programming such as documentaries or investigative programmes, especially on environmental and development issues, are also finding their space. The coverage of environmental messages is also increasing in the other local private channels. At the provincial level, local area television networks are also allocating airtime to environmental issues. Moreover, a growing audience is being exposed to environmental coverage on international channels, like BBC, CNN, National Geographic and others.

However, overall budgets have shrunk as more and more channels vie for the same advertising revenue. In addition, the reliance purely on market input means that corporate advertisers all too often dictate the kind of programming channels are willing to finance.

Radio

Radio has been a neglected medium since the advent of television in Pakistan. This is despite the fact that it is one of the most cost-effective mediums in reaching out to audiences, especially in the rural areas. However, the medium has received more attention since the liberalisation of policies regarding private ownership of radio stations and the advent of FM in the urban areas.

State-owned Radio Pakistan owns and operates four radio stations in Karachi, Hyderabad, Khairpur and Larkana which transmit programmes on AM and SW frequencies as well as on FM. Most of the programming is music, interviews or discussions on social issues with some news content. The Karachi station also produces and transmits programmes for Radio Pakistan's World Service which is beamed to neighbouring regions.

To date, there are three FM channels operating in Sindh, two of which (FM 100 and FM 107), are privately owned and one of which (FM 101) is operated by Radio Pakistan. By their very

nature, FM channels have a short transmitting radius (around 50 square kilometres) and are targeted at urban audiences. Both private FM stations operate only in Karachi with their focus primarily on popular music.

In the last one year, PEMRA has auctioned licenses for operating privately-owned FM radio stations in Karachi (five licenses), Hub Chowki (1), Hyderabad (1), Sukkur (1), Nawabshah (1), Larkana (1), Nooriabad (1), Tando Adam (1), Khairpur (1) and Ubaro (1).

Private radio stations are limited in the kinds of programming they are allowed to air. Discussion on politics and other controversial issues is proscribed. However, there has been a marginal increase in programmes related to social and environmental issues and the private channels are airing awareness-raising programmes related to these aspects.

Internet

There are no definitive statistics available about the exact number of computer literate persons in Sindh or in Pakistan, the number of



Nasir Ali Panhwar

Broadcasting through radio

professionals working in the IT sector or even the number of existing software houses. There is a need for a proper survey to be conducted to document this, which may be helpful to future planners.

The total number of individual internet connections is between 1-1.2 million. The Pakistan Software Export Board (PSEB) estimates that about two million people in Pakistan use the internet. Other experts estimate the number may be closer to 1.5 million, making allowances for users of cyber-cafes who do not have individual dial-up accounts and the fact that one connection may be used by the whole family.

Internet service is now available in 138 towns and cities in Sindh because of the government's efforts to make dial-up networking available through Point of Presence telecommunications, whereby callers from smaller towns can connect to Internet Service Providers (ISPs) in the nearest city at the cost of a local call. However, the quality of the service provided is a serious issue. According to the ISPs, about 165 companies nationwide have so far been issued licenses to operate internet services, out of which 64 are members of the Internet Service Providers Association of Pakistan (ISPAK). The majority of them are based in Sindh and a few of the larger ISPs have the majority of clients.

Electronic communication is widespread among people with access to computers, with e-mail serving as a fast and cost-effective mode of communication. In addition, e-mail is increasingly being used for sharing information through large dispersed mailing lists with environment and development activists making particular use of it. The outreach of these mailing lists is more than the actual number of people listed on them since the information they carry is dispersed subsequently through grassroots contact and more traditional media. Electronic communication has served to link businessmen and activists in Sindh with their counterparts in other parts of the country and abroad.

It is important to note that almost all media establishments in Sindh (print, television, and radio) have a presence on the net. The government's "electronic government" initiative

has meant that the Sindh government also makes some information available on the web. Much more information can be made available on the web than is currently present.

Various e-mail lists help environmental and development activists consult and network amongst themselves. Some of the active ones are lists dealing with Sindhi culture and politics, water issues, sustainable development, filmmaking, and India-Pakistan relations, some of which are also contributed to by the Indian, Pakistani and Sindhi expatriates abroad.

The ease with which e-mail networks can be set up to disperse information is demonstrated by one list that sprang up in the wake of the oil spill off Karachi's coast in order to mobilise activists and citizens to lobby for a proper clean-up of the beach and environmental safeguards. It is important to remember that despite the small percentage of people actually accessing the internet regularly, lists can serve a much larger audience and disperse the information to others through more traditional means of communication. Not only were the oil spill activists liaising with advocacy groups engaged in court matters, but also with journalists and broadcasters, providing them with technical information for their coverage accessed from various sources over the internet and individuals not residing in Karachi.

In terms of conservation and sustainable development the internet has been a useful tool. UNDP in collaboration with IUCN Pakistan launched the Sustainable Development Networking Programme (SDNP) globally in 1992. It was seen as a country-driven response to a need identified in the Rio Declaration and Agenda 21 for ready and affordable access to information for decision-making, at all levels, in support of sustainable development. ICTs were recognised as a central tool to achieve this and SDNP Pakistan was among the first national-level projects to be launched. It initially provided e-mail facilities to NGOs, research organisations and government bodies.

Broadband access, which allows clearer multimedia dissemination, including video and Voice Over Internet Protocol (VOIP) or internet-based telephony, has also made an entry in Karachi. One private company is laying fibre-

optic cable infrastructure for providing this access

A recent initiative by the government has been the establishment of National Access Points (NAPs) in Karachi and Islamabad. Known as Pakistan Internet Exchanges, these are international gateways for ISPs to access the internet backbone. Although they have their utility (by containing Pakistan-based traffic within Pakistan and thus saving bandwidth costs), they are now being used to censor undesirable sites. This is affecting system performance by slowing down the internet response times within Pakistan.

Perhaps one of the biggest issues in the near future facing Pakistan, like most developing countries, and Sindh in particular is the "digital divide" - the gap between those with access to and ability to use computers and those without it. This divide is particularly pronounced between urban and rural populations in Sindh, but also exists within urban residents - significantly between young and old populations, literates and illiterates, and the 'haves' and 'have-nots'. The social consequences of the development of a 'knowledge elite' increasingly connected to and with access to the world outside in a sea of people without such knowledge and access can only be imagined. To address this IUCN through SDNP initiated the setting up of Cyber Community Centres (CCCs). Conceived as a type of Community Centre, the CCCs purpose was to extend the required training to assist people living in the suburban areas in accessing information regarding services available locally, recreational information and/or educational data. The ultimate goal of these centres was to promote the introduction and utilization of information and communication technologies in support of sustainable human development. This involved providing rural and remote communities in Gwadar and Mitthi with affordable public access to the communication technologies and, in particular, the internet, as well as the skills to use it effectively. The centres established in these two areas were managed by the local communities.

Cinema

Cinema is still considered one of the most powerful mediums of the twentieth century. Unfortunately, it has been on a death spiral in the country as a whole and in Sindh. Not only are there no Sindhi films being made anymore and attendance at theatres declining in general, but cinemas throughout the province are increasingly shutting down and being replaced by commercial shopping centres or apartment blocks. According to the information gathered by the Urban Resource Centre, 107 cinemas throughout Sindh, including 55 in Karachi alone, had been so converted by May 2000. Of the 96 or so cinema houses existing in Karachi in 1975, only 37 now remain. Some of the secondary cities in Sindh, such as Larkana, now have no formal cinema houses.

There are a number of reasons for this. The general assumption is that the prevalence of cheap, uncensored films, particularly officially banned Indian films on video, VCDs and DVDs, and the rise of cable networks and television, are factors responsible for the decline in cinema attendance. This has certainly played a part, but it is not the whole story, especially if one considers the fact that western countries and even India, with a much wider prevalence of television, cable, and video access, have registered increases in cinema attendance over the years.

A general lack of understanding at the official level of the importance of public spaces such as cinemas, and non-enforcement of laws prohibiting the conversion of cinemas into other commercial concerns, excessive taxation, a lack of easily accessible credit for films and cinema, and arbitrary censorship rules for films are some of the factors that have discouraged the growth of cinema as an industry. There are other more deeply ingrained issues of how the political climate changed post-1977 to discourage all creative expression. With a decline in the freedom to perform theatre, music, dance, all of which are the related arts that enrich cinema, the industry has decayed.

The bleak situation is prompting many filmmakers in Sindh to confine themselves to work on television, to change professions, or if they

can afford it, to head abroad to explore other possibilities. The Karachi International Film Festival, or Kara Film Festival, launched in 2001 is now in its third year, and attempting to revive a culture of cinema in Karachi in particular by showcasing non-mainstream films from Pakistan and abroad and creating alternative spaces for interaction on films. Except that without long-term support from policymakers and without the government addressing some of the problems detailed above, this venture too is likely to meet with little long-term success.

EMERGING TRENDS AND ISSUES

Overall, the trend is towards less state-control over media and more diversity. This is primarily the result of technological advances in the electronic media which have directly and indirectly affected print media. Internet and satellite transmissions have made it extremely difficult for states, particularly under-developed ones like Pakistan, to restrict what people watch and read. Thus there is bound to be more openness and multiplicity of avenues for information and entertainment.

Attempts by the government and big business to control the content of the media are taking a different, less obvious route than before. These are more difficult to combat because they involve the economic collusion of media owners while the government too is favouring the current climate of "globalisation" or privatisation where market forces alone are expected to determine media content.

The growth of opportunities in the electronic media is leading to a mushrooming of new television and radio channels and internet service providers and web portals. However, since revenue is limited, the quality and diversity of content available may suffer. The economic feasibility of this mushroom growth is however not guaranteed and it seems likely that a period of consolidation will soon follow, with many of the current electronic media ventures falling by the wayside. This may lead to another issue: the monopolistic control of the electronic media by large business houses.

While opportunities are growing within the media, a major issue for all of them is the quality of human resources available. A poor educational infrastructure is not producing the numbers of people with the kind of skills required to sustain highly technical and creative ventures in the long-term.

The uneven policies of successive governments, encouraging innovation, choice and expansion, on the one hand, and attempting to curtail it bureaucratically, on the other, are also limiting growth.

Finally, the lack of a general consensus on what constitutes the core of Pakistani society and the lack of an enlightened vision through actionable policy, might allow marginal groups to gain undue influence over the media. Unless this is addressed, media growth may have limited benefits for society and may, in fact, be another form of control this time in the hands of private capital.

There are other problems as well. For example, there is no national training academy or even private schools for cinema-related education on production, direction, technology, acting, music, dance, and so on. A beginning has been made in the establishment of the Visual Studies Department at the Karachi University which now offers courses in film-making techniques and so does the Indus Valley School of Art and Architecture in Karachi. It is possible that these courses may become full-fledged departments for cinema related education.

STAKEHOLDERS

The foremost stakeholders in the media are the public. They have a right to freedom of choice in their sources of information and entertainment, a right to receive and access balanced and pertinent information and news, and a right to expect the media to look after their collective social, economic and cultural interests. However, so far there are no media related consumers' associations. NGOs and community organisations to pressure the media to address their concerns and news regarding their problems.

The second important stakeholders are the members of the media (journalists, publishers,

directors, producers, artists, writers, filmmakers, actors, designers, exhibitors, etc), who create the content of the media. They have a right to their freedom of expression without undue interference or threat and a right to earn their living through their work.

The journalists from Sindh are represented in the Pakistan Federal Union of Journalists, Sindh Union of Journalists, and the Karachi Union of Journalists. Apart from trade union activism, these organisations have a history of struggling against repressive political governments, policies and laws and for greater media freedoms. In addition, there is also the Council of Pakistan Newspaper Editors who has played an important role in creating a more equitable relationship between newspaper owners, publishers and professional journalists. A Forum of Pakistan Environmental Journalists also exists which bands together and raises capacity of writers of environmental issues in the country.

The third stakeholder is the government and its regulators, primarily the Federal Information Ministry and the Provincial Information Department, including PEMRA. They have the right to expect the media to abide by accepted principles of fair play and tolerance as well as to safeguard the collective interests of the people. They also have a right to expect the media to follow the law of the land as long as it is laid down without malafide intentions and to the demonstrable benefit of the public.

FUTURE ACTION

A number of policy issues must be addressed by the government with regard to the media. In addition, some actions are suggested for non-governmental/citizen's groups, which must make a concerted effort to liaise with the media to increase the coverage of environmental and social issues.

Freedom of choice should be guaranteed for the public. This would mean lifting arbitrary restrictions on channels and the un-blocking of sites. Freedom of Expression should also be guaranteed.

Controversial laws such as the new defamation law and the representation on Press Councils need to be reconsidered.

The Freedom of Information law needs to be amended to make access to information easier for all citizens, including those related to social and environmental issues.

The government should consider providing incentives to private broadcasters to reserve time for public services such as documentaries on social and environmental issues.

The formation of a non-governmental Public Service Broadcasting Trust (on the pattern of the one in India) should be considered, which can commission documentaries and other materials on social and environmental issues and arrange for their screening on various television channels.

Credible training institutes for broadcasting, journalism and web design need to be established in collaboration with broadcasting institutions or governmental incentives provided to encourage their establishment.

Incentives need to be provided, credit made available and a clear policy established for the encouragement of cinema and film.

The capacity of journalists needs to be built to ensure more and effective coverage of social and environmental issues. This can be done by strengthening the Forum of Pakistan Environmental Journalists.

There is a need to stimulate the vernacular print media to provide adequate coverage on environmental issues, as the size of this audience is not only more than twice that of the English-reading population, but also because the two audiences differ considerably in terms of income levels, lifestyles, occupation and geographical location.

An important step from the development and environment point of view would be to develop district level mechanisms to promote cross-sectoral planning and implementation through sound data and information systems. Databases related to health, education and population at the federal, provincial and district

levels have already started to be developed. The next step would be to integrate these, along with organised information from other important development areas at the district level, into a District Management Information System (DMIS).

There is also a need to ensure development of local content and social source applications based on the needs of the people of Sindh. In addition, a good initiative would be an IT for development Programme for Sindh for utilization of IT as a means of achieving the development objectives of Sindh.



CHAPTER 23

Non Governmental Organisations



The emergence of a vibrant civil society in Pakistan has translated into a diverse NGO sector. Particularly in Sindh, this can be gauged by the increasing visibility of such organisations and their impact. The expanding advocacy role of NGOs has been recognised by the State. As intermediaries, NGOs have established channels of communication and cooperation between communities, on the one hand, and governments, development institutions and funding agencies, on the other.

By setting up Citizen Community Boards (CCB) in the Local Government Ordinance 2001, the State has found a constitutional way of including NGOs in local governance and formally recognised them as important partners in development. These boards, under the LG ordinance section 109 (12) also receive a generous amount of development funds except that very few boards have been created so far, and those that have are yet to become effective.

Internationally too, there has been a growing recognition of NGO efforts, evident from the shift in donor priorities. Of the 60 million USD allocated for various educational projects in Pakistan, USAID (United States of America) (which re-established its offices in Pakistan recently) pledged a minimum of one million USD per district for the seven districts in Sindh. It seems interested in helping the NGOs strengthen their financial management capacity. The ADB (Asian Development Bank), too, has approved a preparatory technical assistance (TA) grant of 120,000 USD to help plan a health and education project in Sindh. Both the projects have involved NGOs as active partners.

The sector has existed since Independence, with initiatives like All Pakistan Women's Association (APWA), and in later years the Edhi Trust. However, 60 percent of NGOs in Sindh were established between 1987 and 1995, and were formally registered under the Voluntary Social Welfare Agencies (Registration and Control) Ordinance, 1961¹.

The Additional Preparatory Work on Sindh Rural Development Project (Final Report) says that Sindh can rightfully claim to be a pioneer in establishing developmental NGOs². It cites the OPP as the most widely known example of low-cost, innovative participatory development. By the eighties, there was a proliferation of NGOs and CBOs with the establishment of Baanhn Beli, Hands (Health and Nutrition Development society), Shehri, the URC (Urban Resource center), TRDP (Thardeep Rural Development Programme) and others. One reason often given for this proliferation of NGOs is the imposition of a ban on all political activity during

General Zia-ul Haq's military regime because of which activists from leftist and nationalist parties sought to establish CBOs as an outlet.

The CBOs in Sindh exist in the thousands. They were traditionally registered under the Voluntary Social Welfare Agencies Registration Ordinance, 1961. Today, many of them prefer to register under the Trust Act, 1982, since it is easier and less time consuming. Registration under the Societies Act, 1860, by NGOs working in rural Sindh was difficult because registration authorities were based in cities. Recently, the registration fee under this act has been increased tenfold³ making registration unaffordable for many CBOs.

While there have been several attempts at estimating the number of CBOs, registration under different laws, and an absence of a comprehensive database makes the task difficult, if not impossible. The Social Welfare Department (SWD) which administers the Voluntary Social Welfare Agencies Registration Ordinance, 1961 has the best database on the subject.

Compared to other provinces, in Sindh the sector is dominated, by and large, by CBOs. However, there are other non-profit organisations like community organisations (COs) and village organisations (VOs) which have been created by support or pressure from support organisations, thematic and advocacy NGOs, human rights groups, international NGOs, networks and other fora.

The mandate and activities of NGOs operating in urban and rural Sindh diverge significantly. While rural NGOs are primarily involved in service provision, urban NGOs are working towards initiating policy changes through advocacy and by developing models of service delivery through community participation. Such NGOs include Shehri-CBE, which lobbied successfully with the Sindh government to establish an Oversee Committee for the Karachi Building Control Authority. This Committee was composed of NGO representatives, citizens, and government

1. NGO Resource Centre.1980. A Situation Analysis. NGOs in Four Divisions of Sindh, NGORC
2. Halcrow Pakistan (Pvt) Limited & Reza Ali Development Consultants (RADC).July 2002. Additional Preparatory Work on Sindh Rural Development Project (Final Report)
3. Ibid

officials. Similarly, the OPP institutions have been able to develop government-community partnerships for the provision of sewage, electricity, education and health facilities. Aurat Foundation has been able to train women councillors in understanding the new local government system and their role in it. Both rural and urban organisations in this sector have brought about an awareness in society regarding the rights of citizens, the need for transparency and accountability, the problems of development-related concepts and programmes, environmental issues and above all, created interaction between government agencies, NGOs, CBOs and the academia.

Another important aspect of the NGO sector in Sindh is that the press has promoted environmental issues (such as the Kalabagh Dam, the Indus Delta Crisis, the Thar Canal) in a big way. These issues have been picked up by NGOs and CBOs as well, and a close liaison has developed between the media and the NGOs as a result.

One can assert that the present interaction between NGOs, CBOs and the provincial government on all major development issues in Sindh is the result of the work of NGOs. In addition, the increasing involvement of women in the NGO and community sector transpired by the efforts of pioneering NGOs of the early 1980s.

In Sindh, the NGOs can be divided into the following categories:

Community-based organisations (CBOs): These organisations emerged without the catalytic role of any outside agency. Registered under one of the laws, these membership-based organisations usually work for their own communities relying on indigenous financial resources.

Community Organisation (CO) or Village Organisation (VO)/Women Organisations (WO): These are organisations which have been formed as a result of external intervention and are working on issues such as credit facilities, education, health, and physical infrastructure and are being supported by larger NGOs, both financially and technically. They are often registered and are part of larger umbrella organisations.

Field-based Development NGOs: These are intermediary professional organisations working within well-defined geographical areas. They work in a number of sectors with the financial and manpower resources of the community. Their administrative, research, and extension costs are often funded by donor agencies. The changes they bring about in the physical and social environment are replicated through extension and training programmes in other areas of Pakistan. Examples of such NGOs include HANDS, SRSP (Sindh Rural Support Programme), IRC (Indus Resource Centre), SAFWCO (Sindh Agricultural and Forestry Workers Coordinating Organization), NRSP (National Rural Support Programme), OPP (Orangi Pilot Project), Baanhn Beli and TRDP.

NGO Support Organisations: These bodies work for the technical and managerial capacity building of NGOs/CBOs and are distinct from service delivery organisations. These may or may not provide funding, like the NGORC, SPO, and SAP-Pak.

Thematic NGOs: These organisations focus on one theme and develop an expertise in that area including organisations such as the TRC (Teachers Resource Centre) (teacher training), Aurat Foundation (women's issues), PILER (labour education), FPAP (family planning).

Rural Support Programmes: These groups have been established as a replication of the Aga Khan Rural Support Programme (AKRSP) with the active involvement of the government in their funding and governance. Their objective is to achieve rural development through community mobilisation. NRSP (working in Hyderabad, Mirpurkhas, Badin, Thatta) is an example.

Advocacy and Human Rights Groups: These are issue-based organisations which, over time, develop the characteristics of social movements. They create public awareness related to their subject, enter into policy dialogues, develop strategies and follow-up actions. The HRCP, a highly respected advocacy organisation is one such example. Others include: HREP (Human Rights Education Programme), DCHD, WAF, Shehri-CBE, Aurat Foundation and PILER.

International NGOs/Donors: These provide financial and technical assistance to other NGOs and are often viewed as providers of financial resources like the SCF(Save the Children Fund), OXFAM and ActionAid

Networks/Fora: These are networks of NGOs and CBOs based on common concerns, who work for the creation of an enabling environment to address these issues. They also facilitate policy dialogues and resource sharing among NGOs. Examples of such networks are: Sindh NGO Federation (SINGOF), Bhit Shah Declaration Coordinating Council (BDCC) and SINDNET. Details of NGO works and alliances are given in **Appendix 23.1: Sindh NGO Networks and Alliances**⁴ and a list of important NGOs and the fields in which they work are given in **Appendix 23.2: Important NGOs in Sindh and their Areas of Work**.

CONSTRAINTS

The NGOs in Sindh face the same obstacles as their counterparts in the rest of Pakistan. A major constraint is funding, which is dependant on donors usually from outside Pakistan. Funding is allocated for specific programmes that the donors feel are important. Very often, these programmes are not a priority for the CBOs and NGOs for whom they are meant. Funding is also specified for a period of time and then discontinued. As a result, the NGO or CBO is left without resources and, in many cases, has to either close down or negotiate with other donors who coerce it to adopt their agenda. In addition, funds for administrative purposes or capital expenses are a rarity, in the absence of which the NGO/CBO is not sustainable.

In addition to financial constraints, skills such as community mobilisation, technical expertise, documentation, accounts and monitoring for operating NGO programmes are not easily available. Even when they are available, they are unaffordable for CBOs and for most small level NGOs. In addition, a major language divide exists. CBOs and small NGOs function mainly in Urdu language whereas skills are

usually available in English. Also, there are problems of written communication between donors (who want reports, accounts, etc in the English language) and the CBOs and small NGOs who can only provide them in Urdu.

In Sindh, CBOs have been able to network to form associations around specific issues, but NGOs have not been able to form a permanent federation to act collectively in support of their common concerns. This is because of a failure on the part of NGOs to soar above their individual interests and broaden their horizons, embracing larger issues of the social and physical environment.

Another major problem NGOs and CBOs are confronted with is the absence of effective and affordable training institutions for their staff, community leaders and activists. Training programmes are supply driven for the most part and, as a result, substantial capacity building has not taken place. Therefore, even though the sector has expanded considerably, the human resources required to manage it have not developed in the same proportion. The inadequacy of appropriate training is also responsible for the fact that many NGOs still consider their work to be service delivery rather than facilitating communities to develop themselves and take charge of their social and physical environment. Due to the failure of effective training, NGOs and CBOs have not been able to effectively document their work and others, including government policymakers, have not been able to learn from their experience.

In Pakistan as a whole and in Sindh in particular, it is observed that while philanthropy is on the rise, it is directed exclusively to mosques and *madrassahs*. The local donors perhaps seek spiritual returns and the NGOs have not been able to convince them of the capabilities of public-spirited endeavours and win their confidence. As a result, NGOs continue to rely on foreign donor funding and their acumen in understanding local needs⁵.

Another weak area in the functioning of these organisations is lack of accountability and

4. Panhwar, Nasir. Paper on NGO Networks

5. NGO Resource Centre (A Project of Aga Khan Foundation) 1996. Community Organization and Urban Development - A study of selected urban settlements in Karachi. Karachi



NGOs encourage community participation in infrastructure development projects

transparency, especially in account keeping. Because of these failures, many NGOs have been accused of dishonesty which has adversely affected the reputation of others in the field. A very small percentage of NGOs fulfil the obligation of getting their records audited⁶.

The media in Sindh has, by and large, been supportive of the role of NGOs in civil society. However, development NGOs are routinely targeted and viewed with suspicion and hostility by the traditional religious institutions and charity organisations.

EMERGING TRENDS

NGOs in Sindh are becoming increasingly involved in environmental and development issues. This involvement is not only in research, training, extension, awareness raising and advocacy but also in developing models of community participation and community-NGO-government partnerships around issues related to health, education, sanitation, solid waste,

water (both for irrigation and drinking), savings and credit, and security (**Appendix 24.2 give details of NGOs in Sindh and their work areas**). Government policy making institutions interact with NGOs and the CBOs related to them through policy dialogues, seminars and workshops often arranged by the NGOs themselves or by International Financial Institutions (IFI) and UN agencies. The IFIs, UN agencies and other donor programmes also prefer to work through NGOs and most of their social sector programmes (health, education, water, sanitation and forestry) now have a major NGO/CBO involvement, especially "poverty alleviation" components. However, the NGO sector, on the whole, has not been able to completely fulfil the responsibilities assigned to it under these programmes. The failure of SAP-1 and 2, noticed by sections of the media affirms the failure of NGO capability, capacity, and integrity.

The NGO sector is no longer a purely altruistic one but has become a donor-driven business. According to a survey⁷, 45 percent of the staff

6. NGO Resource Centre (A project of Aga Khan Foundation) 1996. NGOs in Four Divisions of Sindh, A Situation Analysis. Karachi
7. Ibid

of NGOs in Sindh are between the ages of 21 and 30 years of age. To deal with donors and to fulfil donor requirements of proposal writing, account keeping, documentation and monitoring, they require training. A number of NGOs have cashed in on this need. For example, NGO Resource Centre (NGORC), LEAD Pakistan, and even PIMS are providing training not only to existing NGO staff and office bearers but also to those wishing to join the 'NGO profession'. Academic institutions such as LUMS in Lahore, and the IBA in Karachi, are also offering similar training. How this will affect the NGO sector in the long run is difficult to gauge, but its immediate impact has laid greater emphasis on deskwork than before and hence led to an increase in the distance between NGO leadership and conditions on the ground. It has also meant an increase in the salary gap between the "trained" leaders and the NGO/CBO worker.

In the last couple of years, NGO support organisations, previously operating from Islamabad, have opened offices in Karachi. These include ActionAid, Trust for Voluntary Organisations (TVO) and Strengthening Participatory Organisation (SPO). It is unclear whether this is in response to a need complimented by the devolution process, or an internal requisite for these organisations to expand due to the availability of funds.

The NGOs in Sindh produce a large volume of literature. Some of them publish a critical documentation of their work through monographs, books, and also their concerns regarding debt, WTO, government and global economic policies, environment and human rights. Most of them also publish journals and newsletters. Such NGOs include IUCN, Shirkatgah, HRCP, OPP institutions, URC, TRDP, Aurat Foundation, TRC and PILER, to name a few. The research literature is usually in English but the newsletters (which are also published by a number small community-based NGOs and CBOs) are also published in Urdu and/or Sindhi. These publications are widely read, especially those in vernacular languages, and discussed by the activists and staff in the NGO sector.

This literature has also encouraged writing and the number of such writers is increasing, albeit

very slowly. The Sindhi language press also reports extensively on environment and development related issues, and makes use of NGO generated literature. An NGO-media relationship is gradually developing.

In the nineties, development professionals started setting up their own NGOs and, at the same time, some old community based CBOs matured into intermediary organisations. Thus, two divergent NGO cultures developed in Sindh but these two types of NGOs complimented each other and a process of fusion began. NGOs set up by development professionals are linking up with CBOs and smaller NGOs to reach the masses while the smaller NGOs and CBOs are adopting and adapting the development models of the NGO led by development professionals.

A major achievement of the NGO sector has been the induction of women into jobs in the environment and development related organisations in Pakistan and in local level politics. More women, even in remote rural areas, are becoming NGO leaders, staff members, workers and activists. NGO led awareness programmes for women on social and physical development issues, politics and human rights are on the rise, and so are women's savings and credit programmes. In the process, new role models for the future generation are being created, and, if the process continues, it is likely to result in a major social revolution within one generation.

STAKEHOLDERS

The major stakeholders in the NGO sector are listed below.

Rural and Urban Communities: The involvement of this stratum is vital for the development sector. Given the poor state of government planning, development, implementation, and monitoring agencies, effective development cannot take place without socially conscious and organised communities which can only be created by local activists.

Larger NGOs: These organisations often provide training and financial support to smaller NGOs and community organisations. They run

parallel programmes and sometimes promote their own agendas to the detriment of the NGO sector as a whole.

Academic Institutions: A number of universities have now recognised the importance of the NGO sector and have included its work in their curriculum. Some of them have also initiated related training programmes. Professional engineering, planning and medical colleges are increasingly involving NGOs in their teaching and promoting models of appropriate technology and community participation.

Local Government: After the devolution process, the local government will have to deal increasingly with local CBOs and NGOs. The process has already begun but progress is slow. It can be improved by involving NGOs and CBOs in the training of councillors, nazim and naib nazim (at all levels) and local government functionaries.

Government Planning and Development Agencies at the Federal and Provincial Levels: These agencies need to institutionalise their relationship with the NGO sector so that they can help guide policy and planning issues. At present, this relationship is ad-hoc and fragmented.

IFIs and Donors: As major benefactors through loans and grants, they are major players and need to better understand NGO constraints and potential.

FUTURE ACTION

For effective development, NGO networks are essential. A common agenda and vision needs to be created by the sector to change donor policies and government perceptions that often view them with suspicion and hostility. This will also help promote development models that are sustainable and do not depend on large foreign loans which increase Pakistan's debt and poverty.

NGOs need to identify and support community activists both financially and through training, without which sustainable change cannot take place. This will increase employment in two ways. One, it will provide employment to the

activists, and, two, it will strengthen the sector in terms of capacity and capability, thereby creating more jobs.

A closer link needs to be created between NGOs and the media, especially the electronic media. The possibility of getting the government or corporate sector to support regular programmes in development-related issues needs to be considered. This will not only inform people regarding NGOs and innovative development programmes, but will also remove a lot of mistrust that exists in certain sections of society regarding these bodies.

It may be worthwhile to consider the creation of a special Sindh NGO responsible for networking with all existing NGOs, to address the issues they raise, juxtapose the models they have constructed into a comprehensive development paradigm for Sindh, and to lobby with the government on that basis. At present, NGO programmes are extremely fragmented and do not relate to an overall development concept. As such, their impact on policy, laws, and implementation is marginal.

There is also a need for parliamentary committees and city governments to provide for NGO representation. The process of public hearings for development projects needs to be initiated so that interaction between NGOs, CBOs, and the government is enhanced.

The federal government's poverty alleviation programmes need to incorporate the NGO sector, which would add a knowledge base to its programme while reducing the donor dependant NGO activities. The government should consider the benefits it may derive from a partnership with the citizen sector once it is freed from its present donor-driven constraints. The NGO sector has a lot of ad-hocism in it and, in many cases, an element of opportunism. The creation of a culture of accountability, transparency and ethics needs to be promoted through new role models by incorporating these aspects into training programmes. Concerted efforts need to be made to further increase women's participation in the development sector, especially in rural areas where such participation is still minimal. For this, programmes focused on and led by women need to be made a priority.



APPENDICES

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Provincial Departments in Sindh

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1.	Agriculture Department	Agriculture Engineering and Water Management, Sindh	Director General, Agriculture Engineering and Water Management, Sindh
		Agriculture Research Sindh	Director General, Agriculture Research, Sindh Hyderabad
		Agriculture Extension Department Sindh	Director General, Agriculture Extension Department Sindh
		Bureau of Supply and Prices	Director General Bureau Supply and Prices
2. a. b. c.	Board of Revenue	Settlement, Survey and Prices Land Records Department	Director of Settlement, Survey and Records
	Revenue Department		
	Land Utilization Department	Relief Department	Relief Commissioner
3.	Chief Minister's Secretariat	Sindh Provincial Inspection, Enquiries and Implementation Team	Chairman, Sindh Provincial Inspection, Enquiries and Implementation Team
4.	Communications Department	Highway Department	Chief Engineer of Highways
5.	Cooperation Department	Cooperation Department	Registrar of Cooperative Societies
6.	Coordination Department		
7.	Culture and Tourism Department	Directorate of Youth Affairs and Sports	Director of Youth Affairs and Sports
8.	Education Department	Technical Education Department	Director Technical Education
		Bureau of Curriculum and Extension, Sindh	Director of Curriculum and Extension, Sindh
9.	Environment Department	Sindh Environmental Protection Agency	Director General Sindh Environmental Protection Agency
10.	Excise Department	Excise Department	Director General Excise and Taxation
11.	Finance Department	Local Audit and Funds Department	Director Local Funds and Audit
12.	Fisheries Department	Fisheries Department	Director General Fisheries Department
13.	Food Department	Food Department	Director of Foods
14.	Health Department	Health Department	Director General Health Services, Sindh, Hyderabad.
		Directorate of Nursing	Director, Nursing

Sr. No.	Secretariat Department	Attached Department	Head of Attached Department
15.	Home Department	Police Department Civil Defense Department	Inspector General of Police Director of Civil Defense
16.	House and Town Planning Department	Town Planning Department	Director, Town Planning
17.	Industries, Commerce Mineral Development Department	Industries and Commerce Department Mineral Development Department Printing and Stationery Department	Director of Industries and Commerce Director of Mineral Development Controller, Printing and Stationery
18.	Information Department	Information Department	Director, General Public Relations
19.	Irrigation and Power Department	Power Department	Chief Electrical Engineer
20.	<i>Katchi Abadis</i> Department		
21.	Law Department	Advocate General Department Solicitor General Department Official Assignees Department	Advocate General Solicitor Official Assignees
22.	Labour Department	Labour Department Labour Appellate Tribunal Minimum Wages Board Manpower and Training Department Inspectorate of Mines	Director of Labour Chairman, Labour Appellate Tribunal Chairman, Minimum Wages Board Director, Manpower and Training Chief Inspector Mines
23.	Livestock Department	Livestock Department	Director General Livestock, Sindh

Source: *The Sindh Government Rules of Business 1999.*

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	Mir Aijaz Hussain Jakhrani	Naib Nazim	0721	516336		512364
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	Mr. Muhammad Iqbal Pakwala	Naib Nazim	071	28412-4		
Khairpur	Ms. Nafeesa Shah	Nazim	0792	554299, 553999	554299	552900 / 551952
	Engr. Sher Mohammad Phulpoto	Naib Nazim	0792	552427		552716 / 552605
Ghotki	Mr. Ali Gohar Mahar	Nazim	0703	51877		53301 / 53444
	Mr. Abdul Bari Khan	Naib Nazim	0703	51877		51664
Nawabshah	Ms. Faryal Talpur	Nazim	0241	70525 - 6	70524	60532 / 61078 021 / 5688272
	Mr. Khalid Hussain Channa	Naib Nazim	0241	70527 - 8	..	62127 / 4550
Naushero feroz	Mr. Masroor Ahmed Khan Jatoi	Nazim	0752	448777	470329	470328 / 470377
		Naib Nazim	0752	448230	..	02425 / 314347

District	Name	Post	Contact Numbers / Fax Numbers			
			Code	Office	Fax	Residence
Hyderabad	Makhdoom Rafique Zaman	Nazim	0221	781865		814115
	Nawab Rashid Ali Khan	Naib Nazim	0221	782365		781816
Dadu	Malik Asad Sikandar	Nazim	0229	612115	612115	610045 / 4133
	Mr. Sadakat Ali Khan Jatoi	Naib Nazim	0229	611439		4061
Badin	Rais Kamal Khan Chang	Nazim	0227	62238 62108		62108 / 61150
	Mr Sohail Akbar	Naib Nazim	0227	62238 62108		

Source: Government of Sindh Website

Listing of Towns and Important City District Functionaries

Sr. No.	Town	Town Nazim	Town Naib Nazim	Town Municipal Officer
1.	Baldia	Aurangzeb Khan	Suleman	Ghulam Hussain Memon
2.	Bin Qasim	Ashique Jamote	Tariq Balouch	Masroor Memon
3.	Gadap	Ghulam Mustafa Balouch	Abdul Sattar Baloch	Ghulam Shabbir Jatoi
4.	Gulberg	Farooq Naimatullah	Usman Baig	Akram Saeed
5.	Gulshan-e-Iqbal	Abdul Wahab	Saleem Azher	Matanat Ali Khan
6.	Jamshed	Ahmed Qasim Parekh	Ashfar Ahmed	Moinuddin
7.	Keamari	Zulfiqar	Ali Muhammed	Amir Ali Unnar
8.	Korangi	Abdul Jamil Khan	Aurangzeb Khan	Abid Zawawi
9.	Landhi	Muhammed Shahid	Bakht Raheem Shah	Iqbal Nafees
10.	Liaquatabad	Dr. Pervaiz Mahmood	Shahabuddin	Ishrat Hussain Siddiqui
11.	Lyari	Abdul Khanq	Malik M. Malik	Pervaiz Junejo
12.	Malir	Azam Ali	Muhammed Wasim	Ghulam Asghar Waggan
13.	New Karachi	M. Shafiq-ur- Rehman	Liaquat Ali Khan	Farrukh Habib
14.	North Nazimabad	Fasihuddin Siddiqui	Maqsood Khan	-
15.	Orangi	Muhammed Shahid	Muhammad Feroz	Niaz Hussain Shah
16.	Saddar	Farooq Faria	M. Wazir Rahber	Zamir Ahmed Khan
17.	Shah Faisal	Mushtaq Ahmed	Ismullah Siddiqui	Ali Muhammed Sheikh
18.	SITE	Amir Nawab	Ahmed Balouch	Tariq Hussain Pirzada

Source: <http://www.karachicity.gov.pk/>

Appendix 3.1: Socio-Economic Data Sindh

Table 1: Language Spoken - Pakistan / Provinces

Languages Spoken	Total		Rural		Urban		1998 Karachi
	1981	1998	1981	1998	1981	1998	
Pakistan							
Urdu	7.60	7.57	1.33	1.48	24.40	20.22	48.52
Punjabi	48.17	44.15	47.52	42.51	49.92	47.56	13.94
Pushto	13.15	15.42	15.05	18.06	8.04	9.94	11.42
Sindhi	11.77	14.10	13.77	16.46	6.43	9.20	7.22
Baluchi	3.02	3.57	3.50	3.99	1.74	2.69	4.34
Brahvi	1.21	-	1.49	-	0.45	-	-
Hindko	2.43	-	2.77	-	1.53	-	-
Siraiki	9.84	10.53	11.97	12.97	4.12	5.46	2.11
Others	2.81	4.66	2.60	4.53	3.37	4.93	12.44
Punjab							
Urdu	4.27	4.5	1.55	2.0	12.08	10.1	
Punjabi	78.68	75.2	78.18	73.6	80.12	78.7	
Pushto	0.76	1.2	0.64	0.9	1.08	1.8	
Sindhi	0.08	0.1	0.11	0.2	0.02	0.1	
Baluchi	0.57	0.7	0.74	0.9	0.08	0.1	
Brahvi	0.01	-	0.01	-	0.01	-	
Hindko	0.04	-	0.04	-	0.04	-	
Siraiki	14.90	17.4	17.90	21.4	6.28	8.4	
Others	0.70	0.9	0.83	1.0	0.30	0.8	
Sindh							
Urdu	22.64	21.05	2.17	1.62	49.68	41.48	
Punjabi	7.69	6.99	4.38	2.68	12.05	11.52	
Pushto	3.06	4.19	0.46	0.61	6.48	7.96	
Sindhi	52.40	59.73	78.23	92.02	18.28	25.79	
Baluchi	4.51	2.11	5.63	1.50	3.03	2.74	
Brahvi	1.08	-	1.67	-	0.30	-	
Hindko	0.35	-	0.06	-	0.74	-	
Siraiki	2.29	1.00	3.44	0.32	0.77	1.70	
Others	5.97	4.93	3.94	1.25	8.65	8.80	
NWFP							
Urdu	0.83	0.8	0.16	0.3	4.81	3.5	
Punjabi	1.10	1.0	0.29	0.2	5.84	4.6	
Pushto	68.30	73.9	68.64	74.0	66.27	73.5	
Sindhi	0.05	-	0.06	-	0.03	-	
Baluchi	0.04	-	0.05	-	0.01	-	
Brahvi	0.01	-	0.01	-	0.03	-	
Hindko	18.13	-	18.14	-	18.02	-	
Siraiki	3.95	3.9	3.88	4.0	4.37	3.2	
Others	7.59	20.4	8.77	21.5	0.60	15.1	
Baluchistan							
Urdu	1.37	0.98	0.30	0.21	7.42	3.42	
Punjabi	2.24	2.52	0.39	0.43	12.67	9.16	
Pushto	25.07	29.64	25.15	32.16	24.64	21.61	
Sindhi	8.29	5.58	8.74	5.27	5.73	6.57	
Baluchi	36.31	54.76	38.28	57.56	25.20	45.84	
Brahvi	20.68	-	22.02	-	13.05	-	

Pakistan	1981	1998	1981	1998	1981	1998
Hindko	0.13	-	0.01	-	0.84	-
Siraiki	3.08	2.42	3.03	1.87	3.34	4.16
Others	2.82	4.12	2.07	2.51	7.10	9.24

Source: Prepared from Population Census Report 1991-1998

Table 2: Sindh Population

Population	1981						1998					
	Total		Urban		Rural		Total		Urban		Rural	
	Actual	%	Actual	%	Actual	%	Actual	%	Actual	%	Actual	%
A. Total Population												
Male	9,999,205	52.58	4,433,430		5,565,775		16,097,591	52.88	7,904,463		8,193,128	
Female	9,029,461	47.45	3,809,606		5,219,855		14,342,302	47.12	6,935,399		7,406,903	
Total	19,028,666		8,243,036	43.27	10,785,630	56.68	30,439,893		14,839,862	48.75	15,600,031	51.25
B. Less than 15 years of age												
Male	4,340,432		1,809,856		2,530,576		6,860,711		3,013,017		3,847,694	
Female	4,239,454		1,698,252		2,541,202		6,155,521		2,812,131		3,343,390	
Total	8,579,886	45.09	3,508,108	42.56	5,071,778	47.02	13,016,232	42.76	5,825,148	39.25	7,191,084	46.1
C. Between 15 & 24												
Male	1,773,897		896,068		877,829		3,144,771		1,511,259		1,458,299	
Female	1,479,537		748,971		730,566		2,970,901		1,686,472		1,459,642	
Total	3,253,434	17.1	1,645,039	19.96	1,608,395	14.91	6,115,672	20.09	3,197,731	21.55	2,917,941	18.7
D. Between 25 & 49												
Male	2,719,676		1,257,543		1,462,133		4,507,959		2,424,398		2,083,560	
Female	2,401,783		1,029,354		1,372,429		3,877,699		1,963,358		1,914,341	
Total	5,121,459	26.91	2,286,897	27.74	2,834,562	26.28	8,385,657	27.55	4,387,756	29.57	3,997,901	25.63
E. Between 50 & 59												
Male	551,804		241,638		310,166		831,661		429,157		402,504	
Female	437,496		167,635		269,861		688,074		347,530		340,544	
Total	989,300	5.2	409,273	4.97	580,027	5.38	1,519,735	4.99	776,687	5.23	743,048	4.76
F. 60 & above												
Male	613,396		228,325		385,071		752,490		351,419		401,071	
Female	471,191		165,394		305,797		650,107		301,121		348,986	
Total	1,084,587	5.7	393,719	4.78	690,868	6.41	1,402,597	4.61	652,540	4.4	750,057	4.81

Source: Prepared from Sindh Population Census Report 1991-1998

Table 3: Sindh Literacy

Literacy	1981						1998					
	Total		Urban		Rural		Total		Urban		Rural	
	Actual	%	Actual	%	Actual	%	Actual	%	Actual	%	Actual	%
A. Total Literacy												
Male	2,763,630	39.74	1,837,863	57.77	925,767	24.54	5,128,915	54.5	4,097,766	69.75	2,045,290	37.89
Female	1,272,674	21.64	1,102,047	42.23	170,627	5.21	6,445,118	34.78	2,842,529	56.66	595,065	12.23
Total	4,036,304	31.45	2,939,910	50.77	1,096,394	15.57	9,580,650	45.29	6,940,295	63.72	2,640,355	25.73
Population 10 & above	12,832,648		5,790,090		7,042,558		21,154,683		10,891,459		10,263,224	
B. Between 10 & 14												
Male	478,056	36.94	301,357	54.07	176,699	23.98	1,170,982	57.54	729,947	74.24	441,035	41.93
Female	293,618	26.94	249,693	50.15	43,925	7.41	814,583	48.03	633,037	70.84	181,546	22.63
Total	771,674	32.37	551,050	52.22	220,624	16.6	1,985,565	53.22	1,362,984	70.71	622,581	33.58
Population between 10 & 14	2,383,868		1,055,162		1,328,706		3,731,022		1,876,745		1,854,277	
C. Between 15 & 24												
Male	832,492	46.94	584,288	65.2	248,204	28.28	1,927,188	61.22	1,257,338	74.55	669,850	45.81
Female	464,690	31.28	413,226	54.81	51,464	7.07	1,225,101	41.07	994,644	65.82	230,457	15.81
Total	1,297,182	39.87	997,514	60.64	299,668	18.63	3,152,289	51.54	2,251,982	70.42	900,307	30.78
Population between 15 & 24	3,253,434		1,645,039		1,608,395		6,115,672		3,197,731		2,917,941	
D. Between 25 & 49												
Male	1,128,785	41.5	737,193	58.62	391,592	26.78	2,412,610	53.52	1,670,450	68.9	742,160	35.62
Female	431,227	17.95	374,200	36.35	57,027	4.16	1,160,152	29.92	1,009,682	51.43	150,470	7.86
Total	1,560,012	30.46	1,111,393	48.6	448,619	15.83	3,572,762	42.61	2,680,132	61.08	892,630	22.33
Population between 25 & 49	5,121,459		2,286,897		2,834,562		8,385,657		4,387,756		3,997,901	
E. Between 50 & 59												
Male	180,109	32.82	121,790	51.1	58,319	18.54	373,907	44.87	256,806	73.89	117,101	29.09
Female	51,131	11.39	40,909	24.35	10,222	3.5	137,982	19.93	121,767	35.04	16,215	4.76
Total	231,240	23.37	162,699	39.75	68,541	11.82	511,889	33.68	378,573	48.74	133,316	17.94
Population between 50 & 59	989,300		409,273		580,027		1,519,735		776,687		743,048	
F. 60 & above												
Male	144,188	23.5	93,235	40.83	50,953	13.23	258,369	34.34	183,225	52.39	75,144	18.74
Female	32,008	6.79	24,019	14.52	7,989	2.61	99,776	15.35	83,399	27.7	16,377	4.69
Total	176,196	16.25	117,254	29.78	58,942	8.53	358,145	25.53	266,624	40.86	91,521	12.2
Population 60 & above	1,084,587		393,719		690,868		1,402,597		652,540		750,057	

Source: Prepared from Sindh Population Census Report 1991-1998

Table 4: Sindh Marital Status

Marital status	1981						1998					
	Total		Urban		Rural		Total		Urban		Rural	
	Actual	%	Actual	%	Actual	%	Actual	%	Actual	%	Actual	%
A. Total Married Population												
Male	3,692,297	65.25	1,595,120	60.8	2,097,177	69.1	5,645,652	61.12	2,684,988	54.89	2,960,664	68.13
Female	3,531,932	73.74	1,430,141	67.74	2,101,791	78.46	5,524,545	67.48	2,488,888	60.36	3,035,657	74.71
Total	7,224,229	69.14	3,025,261	63.89	4,198,968	73.49	11,170,197	64.11	5,173,876	57.39	5,996,321	71.31
Population 15 & above	10,448,780		4,734,928		5,713,852		17,423,661		9,014,714		8,408,947	
B. Between 15 & 24												
Male	378,944	21.36	148,405	16.56	230,539	26.26	696,863	22.16	210,196	12.46	486,667	33.37
Female	787,311	53.21	322,040	43	465,271	63.69	1,344,528	45.3	479,310	31.72	865,218	59.28
Total	1,166,255	35.85	470,445	28.6	695,810	43.26	2,041,391	33.38	689,506	21.56	1,351,885	46.33
Population between 15 & 24	3,253,434		1,645,039		1,608,395		6,115,672		3,197,731		2,917,941	
C. Between 25 & 49												
Male	2,278,212	83.77	1,037,921	82.54	1,240,291	84.83	3,612,902	80.14	1,825,333	75.29	1,787,569	85.79
Female	2,208,385	91.95	925,514	89.92	1,282,871	93.47	3,384,705	87.29	1,646,829	83.88	1,737,876	90.78
Total	4,486,597	87.6	1,963,435	85.86	2,523,162	89.01	6,994,607	83.41	3,472,162	79.13	3,525,445	88.18
Population between 25 & 49	5,121,459		2,286,897		2,834,562		8,385,657		4,387,756		3,997,901	
D. Between 50 & 59												
Male	507,660	92	219,463	90.82	288,197	92.92	742,750	89.31	380,847	88.74	361,903	89.91
Female	335,045	76.58	118,832	70.89	216,213	80.12	505,054	73.4	242,224	69.7	262,830	77.18
Total	842,705	85.18	338,295	82.66	504,410	86.96	1,247,804	82.11	623,071	80.22	624,733	84.08
Population between 50 & 59	989,300		409,273		580,027		1,519,735		776,687		743,048	
E. 60 & above												
Male	527,481	85.99	189,331	82.92	338,150	87.81	593,137	78.82	268,612	76.44	342,525	85.4
Female	201,191	42.7	63,755	38.55	137,436	44.94	290,258	44.65	120,525	40.03	169,733	48.64
Total	728,672	67.18	253,086	64.28	475,586	68.84	883,395	62.98	389,137	59.63	494,258	65.9
Population 60 & above	1,084,587		393,719		690,868		1,402,597		652,640		750,057	

Source: Prepared from Sindh Population Census Report 1991-1998

Table 5: Physical Conditions - Provinces

Physical Conditions	Total		Rural		Urban		
	Punjab	1980	1998	1980	1998	1980	1998
No. of Housing units		7,538,326	10,537,127	-	7,336,193	-	3,200,934
Rental Housing (%)		6.18	7.1	1.5	2.0	19.3	18.9
Owned Housing (%)		79.31	83.0	82.4	87.3	70.6	73.0
One Room Houses (%)		47.94	31.97	-	33.78	-	27.81
2-4 Room Houses (%)		11.59	17.82	-	17.08	-	19.53
Persons / housing unit		6.5	6.9	-	6.9	-	7.1
Persons / room		3.3	3.0	-	-	-	-
Electric Connections (%)		29.06	72.49	13.6	63.34	72.7	93.45
Piped Water in house (%)		10.84	24.34	2.1	11.03	35.7	54.80
Piped Water outside house (%)		3.21	2.18	1.3	1.69	8.4	3.17
Separate Latrine (%)		-	26.52	-	15.08	57.08	52.75
Shared Latrine with other housing unit (%)		-	15.76	-	7.91	9.62	33.75
No Latrine (%)		-	57.72	-	77.01	33.30	13.50
RCC roofs (%)		6.78	21.9	1.3	12.6	22.2	43.3
Sindh							
No. of Housing units		2,781,873	5,022,392	-	2,850,989	-	2,171,403
Rental Housing (%)		10.72	12.20	1.10	1.55	22.98	26.19
Owned Housing (%)		77.04	76.90	85.35	86.00	66.45	64.96
One Room Houses (%)		61.02	56.94	72.84	72.69	45.95	36.25
2-4 Room Houses (%)		8.57	10.64	-	5.03	-	18.01
Persons/ housing unit		7.1	6.0	7.1	5.5	7.0	6.8
Persons/ room		3.94	3.33	4.73	3.93	3.33	3.09
Electric Connections (%)		35.92	70.08	10.94	52.62	67.76	93.00
Piped Water in house (%)		20.85	37.17	3.76	13.53	42.63	68.21
Piped Water outside house (%)		19.21	4.53	4.90	3.29	37.45	6.17
Separate Latrine (%)		-	35.36	-	24.23	74.71	49.97
Shared Latrine with other housing unit (%)		-	30.57	-	20.08	9.51	44.33
No Latrine (%)		-	34.08	-	55.69	15.79	5.70
RCC roofs (%)		15.9	25.53	1.38	6.44	34.48	50.60

Physical Conditions	Total		Rural		Urban	
	1980	1998	1980	1998	1980	1998
NWFP						
No. of Housing units	1,615,616	2,210,455	-	1,814,707	-	368,748
Rental Housing (%)	9.99	8.5	6.2	4.4	32.2	28.9
Owned Housing (%)	75.09	80.6	78.4	84.0	55.9	63.7
One Room Houses (%)	49.77	27.7	-	28.61	-	23.28
2-4 Room Houses (%)	11.03	18.69	-	18.39	-	20.22
Persons/ housing unit	7.0	8.0	-	8.0	-	7.9
Persons/ room	3.6	3.3	-	-	-	-
Electric Connections (%)	33.48	72.2	25.5	67.4	80.5	95.8
Piped Water in house (%)	7.95	27.2	3.6	21.9	34.0	53.5
Piped Water outside house (%)	9.09	12.3	6.7	12.7	23.6	10.1
Separate Latrine (%)	-	24.51	-	21.09	59.67	41.57
Shared Latrine with other housing unit (%)	-	18.17	-	13.86	7.30	39.68
No Latrine (%)	-	57.32	-	65.04	33.00	18.75
RCC roofs (%)	4.79	16.4	2.3	11.8	19.6	39.2
Baluchistan						
No. of Housing units	592,814	971,116	-	775,954	-	195,162
Rental Housing (%)	4.58	4.99	1.03	1.14	23.99	20.31
Owned Housing (%)	84.02	86.64	87.84	90.45	63.14	71.48
One Room Houses (%)	60.47	42.77	64.25	46.66	39.79	27.33
2-4 Room Houses (%)	9.30	13.84	-	12.37	-	19.68
Persons/ housing unit	7.6	6.7	7.6	6.4	7.6	7.8
Persons/ room	4.2	3.05	4.5	3.05	3.2	3.00
Electric Connections (%)	13.48	46.62	6.33	36.87	54.95	85.37
Piped Water in house (%)	6.56	25.31	1.07	14.84	36.61	66.94
Piped Water outside house (%)	7.65	4.33	3.16	4.01	32.21	5.59
Separate Latrine (%)	-	18.58	-	14.46	63.66	34.94
Shared Latrine with other housing unit (%)	-	29.26	-	23.61	9.93	51.70
No Latrine (%)	-	52.16	-	61.92	26.41	13.36
RCC roofs (%)	2.77	5.19	0.81	1.42	13.51	20.19

Source: Prepared from Sindh Population Census Report 1991-1998

Appendix 5.1: Water Requirement for Crops in Sindh

Table 1: Water Requirement for *Kharif* Crops in Sindh during the Year 2001-02

Sr. No.	Crop	Area in Ha*	Delta in Acre Inches	Water Requirement at Field in MAF
1.	Cotton	547,413	36	4.058
2.	Rice	461,120	70	6.647
3.	Sugarcane	240,693	64	3.172
4.	Jowar	89,175	27	0.496
5.	Bajra	100,327	27	0.558
6.	Mango	45,780	60	0.566
7.	Banana	27,305	60	0.337
8.	Chillies	27,565	40	0.227
9.	Fodder	121,232	24	0.599
10.	Maize	5,473	30	0.034
11.	Mung	11,116	18	0.041
12.	Mash	2,170	18	0.008
13.	Arhar	466	18	0.002
14.	Other Pulses	1,540	18	0.006
15.	Sesamum	2,516	21	0.011
16.	Guava	7,180	60	0.089
17.	Dates	23,366	60	0.289
18.	Other Fruits	3,779	60	0.047
19.	Water melon	1,849	60	0.023
20.	Musk Melon	1,688	60	0.021
21.	Lady Finger	3,903	60	0.048
22.	Tinda	2,212	60	0.027
23.	Brinjal	1,729	60	0.021
24.	Other Vegetables	4,273	60	0.053
25.	Ground Nut	1,882	29	0.011
26.	Castor seed	2,489	21	0.011
	Total	1,738,241		17.401

Source: Directorate General, Agriculture Extension Sindh

Table 2: Water Requirement for *Rabi* Crops in Sindh during the Year 2001-02

Sr. No.	Crop	Area in Ha*	Delta in Acre Inches	Water Requirement at Field in MAF
1.	Sugarcane	240,693	32	1.586
2.	Barley	14,122	19	0.055
3.	Rape & Mustard	64,511	16	0.213
4.	Canola	11,586	16	0.038
5.	Sunflower	38,530	16	0.127
6.	Saf-flower	45	14	0
7.	Chillies	11,022	40	0.091
8.	Garlic	1,676	66	0.023
9.	Coriander	1,978	40	0.016
10.	Other Condiments	384	40	0.003
11.	Gram	38,486	18	0.143
12.	Lentil	8,025	18	0.03
13.	Mattar	64,537	18	0.239
14.	Other Pulses	1,348	18	0.005
15.	Onion	49,736	66	0.676
16.	Potato	400	35	0.003
17.	Tobbaco	126	18	0
18.	Ber Berry	1,210	45	0.011
19.	Orange	1,398	45	0.013
20.	Lemon	1,801	45	0.017
21.	Grapes	258	45	0.002
22.	Other fruits	1,913	45	0.018
23.	Tomato	5,820	45	0.054
24.	Turnip	1,051	45	0.01
25.	Carrot	1,659	45	0.015
26.	Cauliflower	1,715	45	0.016
27.	Cabbage	1,465	45	0.014
28.	Peas	1,351	45	0.013
29.	Other vegetables	6,594	45	0.061
30.	Rabi Fodders	152,538	40	1.256
	Total	1,601,202		8.532

Source: Directorate General, Agriculture Extension Sindh

Crop Varieties Released in Sindh by the Provincial Seed Council upto 2002

Crop	Variety	Year of release	Name of Institute
Cotton	Qalandari	1974	Agriculture Research Institute, Tandojam
Cotton	Sarmast	1975	Agriculture Research Institute, Tandojam
Cotton	K-68	1977	Agriculture Research Institute, Tandojam
Cotton	NIAB-78	1983	Nuclear Institute of Agriculture, Faisalabad
Cotton	Rehmani	1985	Agriculture Research Institute, Tandojam
Cotton	Shaheen	1988	Cotton Research Institute, Sakrand
Cotton	Reshmi	1991	Agriculture Research Institute, Tandojam
Cotton	CRIS-9	1993	Cotton Research Institute, Sakrand
Cotton	Chandi-95	1996	Nuclear Institute of Agriculture, Tandojam
Cotton	Marvi (CRIS-5A)	2001	Cotton Research Institute, Sakrand
Cotton	Shahbaz	2001	Agriculture Research Institute, Tandojam
Cotton	CRIS-134	2002	Cotton Research Institute, Sakrand
Cotton	Sohni	2002	Nuclear Institute of Agriculture, Tandojam
Wheat	Pavon	1978	Agriculture Research Institute, Tandojam
Wheat	ZA-77	1982	Agriculture Research Institute, Tandojam
Wheat	TJ-83	1985	Agriculture Research Institute, Tandojam
Wheat	Sarsabz	1986	Nuclear Institute of Agriculture, Tandojam
Wheat	Soghat-90	1990	Wheat Research Institute, Sakrand
Wheat	Mehran-89	1991	Wheat Research Institute, Sakrand
Wheat	Anmol-91	1993	Wheat Research Institute, Sakrand
Wheat	Abadgar-93	1996	Wheat Research Institute, Sakrand
Wheat	Kiran-95	1996	Nuclear Institute of Agriculture, Tandojam
Wheat	Marvi-2000	2002	Nuclear Institute of Agriculture, Tandojam
Wheat	Moomal-2002	2002	Wheat Research Institute, Sakrand
Rice	IRRI-6	1969	Rice Research Institute, Dokri
Rice	IR-841	1972	Rice Research Institute, Dokri
Rice	DR-82	1982	Rice Research Institute, Dokri
Rice	DR-83	1983	Rice Research Institute, Dokri
Rice	Lateefy	1983	Agriculture Research Institute, Tandojam
Rice	Sada Hayat	1988	Agriculture Research Institute, Tandojam
Rice	IRRI-9	1988	Rice Research Institute, Dokri
Rice	DR-92	1993	Rice Research Institute, Dokri
Rice	Shua-92	1993	Nuclear Institute of Agriculture, Tandojam
Rice	Khushboo-95	1996	Nuclear Institute of Agriculture, Tandojam
Rice	Kanwal-95	1998	Rice Research Institute, Dokri
Rice	Shadab	1999	Nuclear Institute of Agriculture, Tandojam
Rice	Sarshar	2001	Nuclear Institute of Agriculture, Tandojam
Sugarcane	Gulabi	1998	Agriculture Research Institute, Tandojam
Sugarcane	NIA	1999	Nuclear Institute of Agriculture, Tandojam

Source: Sindh Seed Corporation, Hyderabad

Fish Species of the Indus Basin

About 127 species, belonging to 64 genera and 24 families have been recorded as freshwater fish found in the lower Indus Basin including those of brackish water habitat found in estuaries of Indus Delta (Mott. Macdonald International 1992).

The main fisheries of commercial value are:

- **Pallah** (*Tenualosa (Hilsa) ilisha*): An anadromous species, which ascends into river Indus from the sea for breeding between April and September and caught in abundance. The upstream migration of this commercially important fish has been restricted up to Kotri Barrage and is related to the inflow of river and the intensity with which it falls into the sea. This species which once dominated 70 percent of fish catch prior to damming of the river, has reduced to 15 percent in mid 80s. The population of Pallah has been reduced further as the discharge of freshwater below Kotri is reduced due to the building of upstream barrages and dams and lack of conservation methods to protect this endangered species. The fish was restricted from ascending beyond Sukkur with the construction of Sukkur Barrage in 1932 and later up to Kotri with the construction of Kotri Barrage in 1954.
- **Flood plain species:** Major Carps, members of a commercially important group of fishes, belong to family Cyprinidae are *Labeo rohita*, locally called as Rohu, Dambro or Kulhro; *Labeo calbasu*, locally called as Dahi; *Catla catla*, locally called as Catla, Thaila, or Thaila; *Cirrhina mrigala*, locally called as Mrigal, Morakha or Morakhi. These are important and highly priced, and their catch is from the Indus, lakes, dams, reservoirs and irrigation canals, including the drains and all Indus inundation channels. The production of major carps, also known by its habitat as Flood Plain Species, is dependent on floods in the Indus and the intensity of freshwater flow. Late floods and reduced intensity of flood reaching downstream in the monsoon season due to damming of the river has reduced effects on the breeding, spawning and propagation of major carps.
- **Riverine species:** Tend to remain in the river, and can spawn either in the marginal reed beds and other vegetation or in flowing water. None are of major commercial importance except caught for cheap source of protein in the diet of the local population and mixing in poultry and cattle feed.
- **Wetland species:** The important wetland species in the Indus Basin:
 - The Murrells (Snakehead): Quite a few are available and locally called Sonwal and Shakur (*Ophiocephalus sp*, *Channa obscura* and *Channa channa*).
 - Catfishes: Quite a few species available. The major ones are *Wallago attu* (local name Jarko and Malli); *Mystus spp.* (local name Khagga) and *Eel Mustacembeles sp.* (local name Guj).

Appendix 8.1 Flora in the Different Regions of the Sindh Arid Zones

Table 1: Vegetation Composition and Dominant Species at Various Range Sites in Tharparkar

Range site	Dominant species	Range site	Dominant species
Malheo-jo-Tar	<i>Euphorbia cauducifolia</i>	Adhigam	<i>Euphorbia cauducifolia</i>
Khanore	<i>A. senegalensis</i> ; <i>Calligonum</i> ; <i>Polygonoids</i>	Lohiyar	<i>Tecoma undulata</i> ; <i>Cenchrus ciliaris</i>
Pabuhar	<i>Panissicum sp</i> ; <i>Cenchrus bifloris</i>	Vakerio	<i>Panicum sp. Eleusine flagellifera</i>
Chilhiar	<i>Prosopis cineraria</i> ; <i>Lasiurus indicus</i>	Bhalva & Vinjhi	<i>Sporobolus sp.</i> ; <i>Aeloropus villosus</i> ; <i>Desmotachya bippinata</i>
Kabul-jo-Tar	<i>Panicum sp.</i>	Khambhro	<i>Prosopis cineraria</i>
Pathrio	<i>Prosopis cineraria</i> ; <i>Eleusine flagellifera</i>	Hathongo	<i>Panicum sp.</i> ;
Jhainrio	<i>Aristida sp.</i>	Rar	<i>Lasiurus indicus</i>

Source: Khan and Baluch, 1972

Table 2: Land Forms and Vegetation of Kohistan Ranges

Range site	Vegetation	Range site	Vegetation
High mountain range (500-2170m)	Open bush land <i>Acacia Senegal</i> <i>Ziziphus nummularia</i> <i>Chrysopogon aucheri</i> <i>Grewia sp.</i>	Upper foot slopes (200 - 500)	<i>Aristida sp. Lasiurus indicus</i> <i>Chymbopogon Jwar</i> , <i>Ziziphus nummularia</i>
High mountain range (500-2000 m)	Sparse open bush <i>Acacias Senegal</i> , <i>Chrommiphora wightii</i> , <i>Cordia gharaf</i> , <i>Grewia sp.</i>	Lower foot slopes (10 - 20 m)	Wooded brush land thickets. <i>Prosopis cineraria</i> , <i>Cenchrus ciliaris</i> <i>Indegofera oblongifolia</i> <i>Cassia holocerica</i>
Low hill range (50-500 m)	Sparse open bush <i>Acacia Senegal</i> <i>Euphorbia cauducifolia</i> , <i>Lasiurus indicus</i>	Sedimentary plain (50 - 100 m)	Wood land <i>Acacia nilotica</i> , <i>Prosopis cineraria</i> <i>Eleusine flagellifera</i> <i>Salsola foetida</i>
Stony plateau 50-500	Sparse open dwarf shrub land, <i>Baleria acanthoides</i> , <i>Ziziphus nummularia</i> , <i>Lasiurus indicus</i> , <i>Aristida sp.</i>	Alluvial Indus plain (20 - 5m)	<i>Salsola vermiculata</i> <i>Capparis aphylla</i> <i>Alhaji murorum</i> <i>Cynodon dactylon</i>
Dissected outcrops (50 - 100 m)	Sparse open dwarf shrub land, <i>Acacia Senegal</i> , <i>Euphorbia cauducifolia</i> , <i>Cordia gharaf</i> , <i>Lasiurus indicus</i>	River beds and drainage zones (50 -100 m)	Woodland and riverine thickets <i>Tamarix aphylla</i> <i>Tecoma undulata</i> <i>Acacia jacquemonti</i> <i>Sacharum spontaneum</i>
Colluvial fans (100 - 200 m)	Open bush land <i>Saccharum spantaneum</i> , <i>Pterophyllum oliveri</i>	Recent sand dunes (50-100 m)	Bushed grassland <i>Lepodenia pyrotechneca</i> <i>Cenchrus pennisetiformis</i> <i>Panicum turgidum</i> <i>Calligonum polygonoides</i>

Source: FAO, 1975

Table 1 : Important Mammal Species of Wild Animals of the Arid Zones of Sindh

Sr. No.	Common name	Zoological name	Habitat	Status
1.	Indian Gazelle (Chinkara)	<i>Gazella gazella</i>	Thar, Nara bordering area and Kirthar National Park	Original population of Thar and Nara seems to be exterminated
2.	Sindh Ibex (Sarain)	<i>Capra agagrus</i>	Arid hills and rocks of Kirthar range and Kirthar National Park (K. N.Park)	Protected in Kirthar National Park and areas of local sardars
3.	Urial	<i>Ovis orientalis</i>	Kirthar range and K.N. Park.	Protected in K. N.Park and Daryaro mountains of Larkana
4.	Nilgiri	<i>Boselaphus tregocamelus</i>	South of Nagarparkar migrant from India	Rarely found
5.	Asiatic wild ass	<i>Equis hemionus</i>	Ran of Kutch and Thar	Endangered
6.	Indian crested porcupine	<i>Hystrix indica</i>	Thar, Nara and Kohistan	Common
7.	Indian Hare	<i>Lopus migrcollis davanus</i>	Thar and Kohistan	Common in Mithi and Diplo
8.	Indian Pangolin	<i>Manis crassicaudata</i>	Kohistan	Rare
9.	Panther or Leopard	<i>Panthera pardus</i>	Kohistan	Rare
10.	Indian Wolf	<i>Canis lupus pallipea</i>	Kirthar range and Thar	Rare
11.	Jackal	<i>Canis aurius</i>	Thar, Nara and Kohistan	Common
12.	Desert Fox	<i>Vopus vulpus pusilla</i>	Tharparkar and Kohistan	Rare
13.	Wild cat	<i>Verricula indica</i>	Thar	Rare
14.	Common Mongoose	<i>Herpestes edwardsi</i>	Tharparkar	Rare
15.	Striped Hyena	<i>Hyena hyena</i>	Thar and Kohistan	Rare
16.	Desert cat	<i>Felis libyca</i>	Tharparkar	Rare
17.	Honey Badger	<i>Mellivora capensia</i>	K. N.Park	Rare
18.	Wild boar	<i>Sus scrofa</i>	Nara	Common

List of Trees, Shrubs and Other Plants of the Forests of Sindh

Local Name	Botanical Name
Ak	: <i>Calotropis procera</i>
Amb	: <i>Mangifera indica</i>
Angari	: <i>Amaranthus species</i>
Asri	: <i>Tamarix articulata (aphylla)</i>
Babul	: <i>Acacia arabica (nilotica)</i>
Bahan	: <i>Populus euphratica</i>
Ber	: <i>Zizyphus jujubs (Manratiana)</i>
Bhatar	: <i>Lausen species</i>
Buh	: <i>Asurua lana-ta</i>
Bukan	: <i>Lippias nodiflora</i>
Bur	: <i>Ficus bengalensis</i>
Chabbar	: <i>Eleusine aegyptica</i>
Chatura	: <i>Xanthium strumatum</i>
Dubh	: <i>Cynodon dactylon</i>
Gedoor (Lasura)	: <i>Cordia myxa (dichotoma)</i>
Gidamari (Imli)	: <i>Tamarindus indica</i>
Gidar phalli	: <i>Astragalus Contrortuplicentus</i>
Jamu (Jaman)	: <i>Eugenia jambolana or Szyginum cumuni</i>
Jar	: <i>Salvadora oleoides</i>
Jhil	: <i>Indigofera pauciflora (oblongifolla)</i>
Jhangra ber (Jangli ber)	: <i>Zizyphus nummularia</i>
Kalvari	: <i>Capparis spinosa</i>
Kandero	: <i>Alhagi camelorum</i>
Kandi	: <i>Prosopis spicegera</i>
Kanwal peru	: <i>Solanum incertum</i>
Kanh	: <i>Saccharum spontaneum</i>
Khabbar	: <i>Salvadera persica</i>
Khip	: <i>Orphanthera viminea (Leptadenia sportium or Phyrotec)</i>
Khusbudar kandi	: <i>Acacia farnesiana</i>
Kinro	: <i>Salvia species</i>
Kirar	: <i>Capparis aphyllia (Decidua)</i>
Lai (Lye)	: <i>Tamarix dioica / troupii</i>
Lalri	: <i>Withania somnifera</i>
Lani	: <i>Salsola foetida</i>
Liar	: <i>Cordia rothii</i>
Lulliar	: <i>Achyranthes atennifolia</i>
Mesquite	: <i>Prosopis juliflora</i>
Munj	: <i>Saccharum munja (Erianthus munja)</i>
Pann	: <i>Typha elephantiana</i>
Phar	: <i>Blumea species (Blumea aromatica)</i>
Phog	: <i>Calligonum polygonoides</i>
Pipur (papal)	: <i>Ficus religiosa</i>
Sar	: <i>Saccharum spontasium</i>
Sirah	: <i>Albizzia lebbek</i>

Appendix 9.2: Mangrove Species in Pakistan and their Depletion

Table 1: List and Distribution of Mangrove Species in Pakistan

Family/Species	Tree (T) Distribution or Shrub (S)	
RHIZOPHORACEAE		
Ceriops tagal	(T)	Karachi and Coast of Sindh (Stocks) Mouth of Indus and "Salt Water Creek." (Murray)
Ceriops decandra		Sindh tidal zone; existence considered doubtful
Rhizophora apiculata (T&S)		Tidal marshes at the mouth
Rhizophora mucronata	(T)	of Indus: Miani Hor, Lasbela
MYRSINACEAE	(T)	Mouth of Indus on muddy shores and tidal creeks;
Aegiceras comiculatum (T&S)	(S)	Mangrove swamps at mouth of Indus, Karachi, Miani Hor
AVICENNIACEAE		
Avicennia marina	(T)	Tidal mangrove swamps; Sand-spit, Chinna Creek, Creek, etc., Kalmat Khor
SONNERATIACEAE		
Sonneratia caselaris		Mouth of Indus and tidal zone only

Source: Coastal Environmental Management Plan for Pakistan - UNESCAP, 1989

Table 2: Differences in Mangrove Cover Estimated from Satellite Interpretation in 1977 and 1990

Type of coverage	1977 ha.	1990 ha.
Dense mangroves	52,600	68,100
Medium cover mangroves	not recorded	58,500
Normal mangroves	210,500	not recorded
Sparse cover mangroves	not recorded	31,900
Total mangrove areas	263,100	158,500
% mangrove cover	43.3%	26.6%
Sparse/no vegetation/mudflats	137,600	382,700
Sand	44,500	29,300
Creek areas	162,000	23,600
Salt pans	not recorded	1,100
Total	607,200	595,200

Source: Sea Level Rise - Possible Impacts on the Indus Delta Pakistan, 1992

Appendix 9.3 Grazing Animals in the Indus Delta

Table 1: Number of Buffaloes in the Indus Delta Mangrove Ecosystem

Buffaloes grazing	Port Qasim	Keti Bundar	West Shah Bundar Karochan	Central Shah Bundar	East Shah Bundar	Total
Permanent	300	270	455	740	675	2440
Temporary	0	105	439	75	160	779
Total	300	375	894	815	835	3219

Source: University of Sindh, Jamshoro, Pakistan, 1998

Table 2: Number of Camels in the Indus Delta Mangrove Ecosystem

Camel browsing	Port Qasim	Keti Bundar	West Shah Bundar Karochan	Central Shah Bundar	East Shah Bundar	Total
Permanent	200	935	1521	1423	1124	5203
Temporary	0	71	281	400	73	825
Total	200	1006	1802	1823	1197	6028

Source: University of Sindh, Jamshoro, Pakistan, 1998

List of Schemes for Irrigated Plantations

Name of Scheme	Physical Target (in hectares)
Guddu barrage zone afforestation over 24,000 acres (1964-65 to 1978-79)	24,000
Raising of IP in Loyd barrage (1965-66 to 1972-73)	7,000
Eucalyptus Plantation Pilot Project (1973-74 to 1981-82)	3,200
Industrial wood plantation (1976-77 to 1981-82)	4,700
Afforestation over 3,800 ha in Guddu barrage zone (Phase-II) (1980-81 to 1984-85)	3,800
Introduction of farm forestry (1982-83 to 1988-89)	620
Eucalyptus plantation over 2,080 ha in Khipro forest (Phase-II) (1982-83 to 1990-91)	2,080
Forest development in Badin district (1984-85 to 1991-92)	2,000
Raising of IP in Garhi Yasin forest (1985-86 to 1989-90)	1,280
Raising of IP over 3,000 acres in Larkana district (1985-86 to 1989-90)	
Raising of IP in Dadu district (1985-86 to 1989-90)	1,306
Raising of plantation in Andaldal forest of Shikarpur division (1985-86 to 1989-90)	1,254
Raising of IP over 400 ha in Miani forest of Hyderabad district (1987-88 to 1989-90)	400
Crash programme of forestry development in Jacobabad (1987-88 to 1989-90)	480
Raising of irrigated plantations of industrial importance in Sukkur (1988-89 to 1997-98)	3,040
Sindh Forestry Development project (1991-92 to 1998-99)	21,000
Afforestation of Hasan Wahan & Amrote forests (1976-77 to 1980-81)	1,200
Raising of IP in Khaso, Khanani, Malariri forests of Thatta district (1988-84 to 1992-93)	880

Details of Bird Counts in Wetlands of Sindh

Sr. No	Common Name	WETLANDS OF SINDH																
		Rehri Creek	Clifton Beach	Hawk-esbay	Cap e Mon ze	Hub-		Keen-		Char wo	Pho sna I & II	Thar i Matli	Jubho / Kur	Nurr/ri	Lungh Lake	Drig Lake	Bhd-esar II	Nary -asar
						Dam	Haleji	Jhar	Had ero									
1.	Bar tailed godwit	12	53	903	-	70		112	-	-	-	-	880	-	-	-	-	
2.	Kentish plover	440	608	116	7	-	-	-	7	-	-	-	-	-	-	-	-	
3.	Grey plover	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
4.	Little stint	450	-	774	19	200	180	220	271	-	-	-	197	-	-	-	-	
5.	Curlew	3	8	-	17	-	-	4	-	-	-	-	-	-	-	-	-	
6.	Common redshank	150	26	18	46	10	40	1	8	-	-	-	-	-	125	18	4	
7.	Common sandpiper	40	3	46	-	170	82	84	16	-	-	-	-	-	-	-	8	
8.	Terek sandpiper	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
9.	Reef heron	40	-	67	-	-	-	-	-	-	-	-	-	-	-	-	-	
10.	Grey heron	120	16	28	9	26	24	44	16	-	-	-	6	12	-	-	-	
11.	Herring gull	1200	-	-	-	18	12	77	4	-	-	-	68	170	-	-	-	
12.	Black headed gull	600	38	77	-	188	98	320	220	-	4	-	110	182	-	-	-	
13.	Slender billed gull	400	1830	250	200	-	-	-	-	-	-	-	-	-	-	-	-	
14.	Common tern	500	-	-	-	-	-	-	12	-	-	-	-	-	-	-	-	
15.	Black-winged stilt	-	30	154	-	120	160	270	-	24	-	124	-	-	-	12	24	
16.	Dunlin	-	-	717	-	-	-	-	-	-	-	-	-	-	-	-	-	
17.	Greater Flamingo	-	166	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
18.	Large cormorant	-	1581	7	-	220	-	-	70	-	-	-	-	-	-	-	-	
19.	Lesser black backed gull	-	321	76	250	-	-	-	-	-	-	-	-	-	-	-	-	

Sr. No	Common Name	WETLANDS OF SINDH																	
		Rehri Creek	Cliftn Beach	Hawk-esbay	Cae Mon ze	Hub-		Keen-			Char wo	Pho osna I & II	Thar i Matli	Jubho / Kur	Nurr/ri	Lungh Lake	Drig Lake	Bhd-esar II	Nary - asar
						Dam	Haleji	Jhar	Had ero										
20.	Little egret	-	50	-	3	112	80	86	42	10	-	-	-	-	100	40	2	4	
21.	Little ringed plover	-	42	24	-	-	14	-	2	-	-	-	-	-	-	-	-	-	
22.	Little tern	-	72	12	-	18	14	46	4	-	-	-	-	-	-	-	-	4	
23.	Osprey	-	48	16	3	-	-	-	-	-	-	1	-	-	-	-	-	-	
24.	Oyster catcher	-	221	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
25.	Pariah Kite	-	330	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
26.	Red wattled lapwing	-	7	-	-	110	46	220	10	-	-	-	-	-	34	240	2	12	
27.	Ruff	-	26	9	-	-	-	-	-	-	-	-	-	-	-	60	-	-	
28.	Wood sandpiper	-	-	19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
29.	Yellow wattled lapwing	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
30.	Common shelduck	-	-	53	-	-	-	-	-	-	-	-	-	160	-	-	-	-	
31.	Intermediate egret	-	-	124	-	32	55	22	4	-	4	-	-	-	80	50	-	-	
32.	Pelican	-	-	113	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
33.	Avocet	-	-	1163	-	-	-	-	20	-	-	-	-	-	-	-	-	-	
34.	Indian shag	-	-	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
35.	Common starling	-	-	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
36.	Yellow wagtail	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
37.	Common pochard	-	-	-	9	650	3500	2500	1100	62	2050	80	2440	417	200	300	-	-	
38.	Wigeon	-	-	-	1	310	2450	2650	900	-	621	160	1210	2500	500	300	-	-	

Sr. No	Common Name	WETLANDS OF SINDH																
		Rehri Creek	Cliftn Beach	Hawk-esbay	Cae Mon ze	Hub-		Keen-		Char wo	Pho sn a I & II	Thar i Matli	Jubho / Kur	Nurr/ri	Lungh Lake	Drig Lake	Bhd-esar II	Nary-asar
						Dam	Haleji	Jhar	Had ero									
39.	Common teal	-	-	-	15	1650	5260	1200	1200	-	1620	2025	2200	6700	8000	6000	-	22
40.	Marsh sandpiper	-	-	-	2	-	-	6	4	-	-	-	-	-	-	-	-	-
41.	Whimbrel	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-
42.	Sandwich tern	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
43.	Casplan tern	-	-	-	6	6	2	18	-	-	-	-	2	4	-	-	-	-
44.	Marsh harrier	-	-	-	4	6	-	4	7	1	1	-	-	-	-	-	-	-
45.	Gadwall	-	-	-	-	116	2500	1100	5	-	251	1500	960	8392	1000	500	-	12
46.	Mallard	-	-	-	-	806	350	-	-	-	-	-	-	-	20	10	-	-
47.	Pintail	-	-	-	-	162	2800	1655	2050	-	3150	1260	730	9780	4000	3500	-	10
48.	Northern shoveller	-	-	-	-	995	4850	2600	560	-	480	400	1480	1250	15000	12000	-	16
49.	Tufted Duck	-	-	-	-	460	850	12	1050	-	6	-	270	460	-	-	-	-
50.	Common coot	-	-	-	-	1680	-	-	-	-	-	-	-	-	-	-	-	-
51.	Great crested grebe	-	-	-	-	1	2	-	-	-	-	-	-	-	-	-	-	-
52.	Black necked grebe	-	-	-	-	32	110	-	-	-	-	-	-	-	-	-	-	-
53.	Little cormorant	-	-	-	-	370	250	172	190	52	25	-	-	-	-	-	-	6
54.	Cattle egret	-	-	-	-	86	170	46	-	-	-	-	-	-	-	-	-	-
55.	White tailed plover	-	-	-	-	44	21	44	-	-	-	-	-	-	19	50	-	-
56.	Greenshank	-	-	-	-	22	6	4	1	-	-	-	-	-	-	-	-	2
57.	Green sandpiper	-	-	-	-	96	66	110	20	-	4	-	-	-	-	-	2	04

Sr. No	Common Name	WETLANDS OF SINDH																
		Rehri Creek	Cliftn Beach	Hawk-esbay	Cae Mon ze	Hub-		Keen-		Char wo	Pho osn a l & ll	Thai Matli	Jubho / Kur	Nurr/ri	Lungh Lake	Drig Lake	Bhd-esar ll	Nary - asar
						Dam	Haleji	Jhar	Had ero									
58.	Red necked phalarope	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	
59.	Common snipe	-	-	-	-	4	26	32	6	-	-	-	-	-	-	-	-	
60.	Gull billed tern	-	-	-	-	12	40	224	26	-	-	-	-	-	-	-	-	
61.	Pallas'e fishing eagle	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	
62.	Imperial eagle	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	
63.	Greater spotted eagle	-	-	-	-	4	4	6	-	1	1	-	-	-	-	-	-	
64.	Blue cheeked bee eater	-	-	-	-	6	-	-	-	-	-	-	-	-	-	-	-	
65.	Indian pond heron	-	-	-	-	110	190	-	-	-	-	-	-	-	-	4	32	
66.	Glossy Ibis	-	-	-	-	12	-	-	-	-	-	-	-	-	-	-	-	
67.	Indian cotton teal	-	-	-	-	251	-	-	-	-	-	-	-	-	-	-	-	
68.	Garganey	-	-	-	-	-	55	-	-	-	-	-	-	-	-	-	-	
69.	White eyed pochard	-	-	-	-	-	30	-	-	-	-	-	-	-	500	-	-	
70.	Waterhen	-	-	-	-	-	24	-	-	-	-	-	-	-	-	-	-	
71.	Purple moorhen	-	-	-	-	-	112	-	-	-	-	-	-	85	45	-	-	
72.	Great black headed gull	-	-	-	-	-	4	68	-	-	-	-	-	-	-	-	-	
73.	Whiskered tern	-	-	-	-	-	146	410	34	-	16	-	-	-	-	-	-	
74.	Brahminy kite	-	-	-	-	-	6	2	-	-	-	-	-	-	-	-	-	

Sr. No	Common Name	WETLANDS OF SINDH																
		Rehri Creek	Cliftn Beach	Hawk-esbay	Cae Mon ze	Hub-		Keen-		Char wo	Pho sn a I & II	Thar i Matli	Jubho / Kur	Nurr/ri	Lungh Lake	Drig Lake	Bhd-esar II	Nary-asar
						Dam	Haleji	Jhar	Had ero									
75.	Black kite	-	-	-	-	-	42	-	-	-	-	-	-	-	-	-	-	
76.	Pled kingfisher	-	-	-	-	-	14	12	-	-	-	-	-	-	-	-	-	
77.	Crow pheasant	-	-	-	-	-	10	-	-	-	-	-	-	-	-	-	-	
78.	Indian moorhen	-	-	-	-	-	120	-	-	-	-	-	-	-	-	-	-	
79.	Black c. night heron	-	-	-	-	-	56	-	-	-	-	-	-	-	-	-	-	
80.	Great egret	-	-	-	-	-	120	-	-	-	-	-	-	-	-	-	-	
81.	Purple heron	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	
82.	Termincks stint	-	-	-	-	-	40	-	-	-	-	-	-	-	-	-	32	
83.	Pallied harrier	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	
84.	Long legged buzzard	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	
85.	Dabehick	-	-	-	-	-	-	2	-	-	-	-	-	-	-	2	-	
86.	Common kingfisher	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	
87.	Spoonbill	-	-	-	-	-	-	-	-	-	-	75	95	-	300	-	-	
88.	White stork	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	
89.	Common babbler	-	-	-	-	-	-	-	-	-	-	-	-	115	280	-	-	
90.	Jungle babbler	-	-	-	-	-	-	-	-	-	-	-	-	80	318	-	-	
91.	Blythis reed warbier	-	-	-	-	-	-	-	-	-	-	-	-	35	32	-	-	
92.	White cheeked bulbur	-	-	-	-	-	-	-	-	-	-	-	-	70	180	-	-	

Sr. No	Common Name	WETLANDS OF SINDH																
		Rehri Creek	Cliftn Beach	Hawk-esbay	Cae Monze	Hub-		Keen-			Phosna I & II	Thari Matli	Jubho / Kur	Nurr/i.	Lungh Lake	Drig Lake	Bhd-esar II	Nary-asar
						Dam	Haleji	Jhar	Had ero	Char wo								
93.	Indian roller	-	-	-	-	-	-	-	-	-	-	-	-	-	16	143	-	-
94.	Hoopoe	-	-	-	-	-	-	-	-	-	-	-	-	-	2	9	-	-
95.	House sparrow	-	-	-	-	-	-	-	-	-	-	-	-	-	180	350	-	-
96.	Long tailed prinia	-	-	-	-	-	-	-	-	-	-	-	-	-	7	4	-	-
97.	Common myna	-	-	-	-	-	-	-	-	-	-	-	-	-	45	285	-	-
98.	Bank myna	-	-	-	-	-	-	-	-	-	-	-	-	-	85	170	-	-
99.	Godwit	-	-	-	-	-	-	-	-	-	-	-	-	-	-	80	-	-
100.	Common crane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	012	32
101.	White wagtail	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-
102.	Indian collared dove	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	32	-
103.	Little brown dove	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20	-
104.	Chest nut bellied Sand-grouse	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	44	-
105.	Dusky crag martin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
106.	Egyptian vulture	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
107.	Indian blue peafowl	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		3965	5288	4835	567	8635	24812	14868	7904	158	8234	5550	9549	31181	29673	25861	153	-

Source: Zoological Survey of Pakistan, Volum14, 2002

Appendix 10.2: List of Wetlands in Sindh

Table 1: RAMSAR List of Wetlands of International Importance in Sindh

Name of Site	Location	District	Surface Area (hectares)	Wetland Type	Recognition RAMSAR Site No. (RS#)
Keenjhar (Kalri) Lake	24° 56 N 68° 03 E	Thatta	13468 ²	Freshwater lake	1976 RS# 99
Drigh Lake	27° 34 N 68° 06 E	Larkana	164 ¹ 182 ²	Slightly brackish lake	1976 RS# 100
Haleji Lake	24° 47 N 67° 46 E	Thatta	1704	Artificial freshwater lake	1976 RS# 101
Indus Dolphin Reserve	28° 01 N 69° 15 E	Between Guddu and Sukkur Barrages	125,000 ¹ 44200 ²	River	2001 RS#1065
Jubho Lagoon	24° 20 N 68° 40 E	Thatta	706	Brackish lagoon, mudflats, marshes	2001 RS# 1067
Nurri Lagoon	24° 30 N 68° 47 E	Badin	2540	Brackish lagoon, mudflats	2001 RS# 1069

Source: Scot, t D. A., A Directory of Asian Wetlands, Gland, IUCN, 1989

Table 2: List of Wetlands in Sindh

Name of Site	Location	District	Surface area (hectares)	Wetland type
Ghauspur (Rup) Jheel	28° 08 N 69° 06 E	Jacobabad	Combined with SDL600 ²	Freshwater lake
Sindhi Dhoro Lake (SDL)	28° 09 N 69° 04 E	Jacobabad		Freshwater lake
Hamal Katchri lake	c. 27° 23 N 67° 55 E	Larkana	unknown	Shallow lake, associated marshes
Pugri Lake	27° 18 N 68° 03 E	Larkana	unknown	Shallow brackish lake
Manchar lake	26° 25 N 67° 39 E	Dadu	ca. 6000 ha	Freshwater lake and marshes
Nara Canal area	26°00- 27°15 N 68°47- 69°18 E	Khairpur and Sanghar	ca. 300000	200 small, freshwater, brackish and saline lakes and marshes
Soonhari lake	26° 10 N 69° 04 E	Sanghar	245	Small saline lake and brackish marshes
Sadhori lake	26° 12 N 69° 07 E	Sanghar	unknown	Shallow freshwater lake

Name of Site	Location	District	Surface area (hectares)	Wetland type
Sanghriaro lake	26° 07 N 69° 12 E	Sanghar	380	Shallow brackish lake
Khipro lakes	25°32- 25°49 N 69°29- 69°38 E	Sanghar	ca. 30000	30 small brackish and saline lakes
The Tando Bago lakes	24°45- 24°50 N 68°50- 69°05 E	Badin	unknown	11 shallow fresh and slight brackish lakes and marshes
Phoosna lakes	24° 48 N 68° 54 E	Badin	160 ha	2 shallow slightly brackish lakes
Charwo Lake	24° 50 N 69° 00 E	Badin	100 ha	Shallow freshwater lake and marshes
Khanjo (Khowaja lake)	24° 47 N 69° 05 E	Badin	ca. 500	Freshwater lake and associated marshes
The Badin and Kadhan lagoons	24°15- 24° 30 N 68°35- 69°05 E	Badin	unknown	Very shallow brackish lagoons and wet mudflats
Shahbundar Salt Waste and Jafri lakes	24°06- 24°12 N 67°54- 68°15 E	Thatta	ca. 20000 ha	Salt waste and large brackish to saline lake
Mahboob Shah Lake	24° 30 N 68° 03 E	Sujawal	100 ha	Small fresh to brackish lake and marshes (small lakes in the region: Karo, Karajo, Chatch and Ghungri)
Hadero Lake	24° 49 N 67° 52 E	Thatta	1321	Brackish lake
Hawkes Bay / Sandspit and adjacent creeks	24°47- 24°52 N 66°50- 66°59 E	Karachi	20 km beaches ca. 2000 tidal creeks	Sandy beaches, complex creeks and shallow tidal lagoons, inter tidal mudflats and mangrove swamps
Clifton Beach	24° 47 N 67° 05 E	Karachi	8 km beach	Sandy beach, tidal mudflats, sand dunes
Korangi (KC) and Gharo (GC) creeks	24° 47 N 67° 11 E	Karachi	KC 48386 GC 64370	Tidal creeks, mangrove swamps, tidal mudflats
Outer Indus Delta	23°45- 24°45 N 67°10- 68°15 E	Karachi to Indian border	ca. 300000 200000 mangroves	Tidal river channels, creeks, sandy islands, mangrove swamps, inter tidal flats
Langh (Lungh) Lake	27° 30 N 68° 05 E	Larkana	19	Formerly a freshwater lake fed by rice paddies, now water diverted elsewhere. Wetland has completely disappeared

Source: Scott, D.A., A Directory of Asian Wetlands, Gland, IUCN, 1989

Appendix 11.1 Major Pollutants and Their Load

Table 1: Major Pollutants in the Industrial Wastes from Karachi Region

Sr. No	Industry	Major pollutants
1.	Textile Industries	Metal oxides, colouring compounds, wood and cotton fibres.
2.	Tanneries	Chrome salts, organometallic compounds, high BOD organic wastes
3.	Pharmaceutical industries	A variety of inorganic / organic compounds and toxic substances
4.	Plastic and rubber industries	Polyvinyl chlorides, polyethylene polypropylene, polyesters, etc.
5.	Steel foundries and metallurgical industries	Cooling oils, PCBs, acids and alkaline deoxidizing agents, metal salts
6.	Electroplating of surface coating industries	Heavy metals, metal oxides, metal sulphides, polyhydroxy phenols
7.	Glass, ceramics and tile industries	Metal oxides, CO
8.	Soap and detergents	Fatty acids, glycerines, oils
9.	Fish processing industries	High BOD organic wastes
10.	Chemical industries	Various organic and inorganic compounds
11.	Fertilizers and pesticides	Inorganic compounds, pesticides and insecticides
12.	Power stations	Chlorine, heavy metals, lubricating oil, metal oxides, sulphur compounds

Source: Rizvi et al (1986)

Table 2: Pollution Load Estimates Contributed by Industrial Effluents into the Coastal Waters of Karachi

Sr.No.	Industrial site	No. of Industrial units	Major industries	Share of pollution load (percent approx.)
Lyari River Outfall				
1.	SITE	< 2,000	Textile (60 percent) Leather & Tanneries, chemicals (5 percent) electroplating, plastic & PVC, engineering, iron & steel works, paints, sea salt detergents.	43
2.	West wharf Area	< 30	Engineering factory, chemicals fish processing	5
3.	Karachi City Area	< 2,000	Cement factory, engineering works, variety	12
Malir River Outfall				
4.	L.ITE	< 1,000	Textile, leather, engineering works	15
5.	K.IA	< 500	Refineries, tanneries, power plant, chemicals, detergents, sea salt	10
Sea Outfall				
6.	Pakistan Steel Complex		Steel, metallurgy, ammonium sulphates	5
7.	Gharo City	< 80	Textile	2
8.	HITE	< 100	Chemicals, textiles, foundries and PVC factory	8

Source: Coastal Environment Manager Plan for Pakistan - UN ESCAP, 1989

Appendix 12.1: Flora of Sindh in its Major Habitats

Table 1: Species Found on the Coast / Creeks Near Mangrove Zones

Sr.No.	Trees	Shrubs / undershrubs	Herbs / grasses
1.	<i>Aegicerus majus</i>	<i>Atriplex stocksii.</i>	<i>Aleuropus spp.</i>
2.	<i>Avicennia officinalis</i>	<i>Ipomea aquatica</i>	<i>Cyperus spp.</i>
3.	<i>Brugeria gymnorhiza</i>	<i>Salsola foetida</i>	<i>Echinochloa spp.</i>
4.	<i>Ceriops candolleana</i>	<i>Suaeda spp.</i>	<i>Ipomea bioiba</i>
5.	<i>Rhizophora mucronata</i>		<i>Oryza coarctata</i>
6.	<i>Rhizophora conjugate</i>		<i>Pharagmites karka</i>

Table 2: Species Found in Swamps, Seasonal Inundations, Seepage and Jheels

Sr.No.	Trees	Shrubs & Undershrubs	Herbs & Grasses
1.		<i>Tamarix spp.</i>	<i>Aponogeton spp.</i>
2.		<i>Typha elephantine</i>	<i>Ceratophyllum demersum</i>
3.			<i>Coix aquatica</i>
4.			<i>Nymphaea rubra</i>
5.			<i>Panicum spp.</i>
6.			<i>Polygonum plebejum</i>
7.			<i>Pharagmites karka</i>
8.			<i>Scripus squarrosus</i>
9.			<i>Trapa bispinosa</i>
10.			<i>Vallisneria spirilis.</i>

Table 3: Trees, Shrubs and Under-shrubs of Sand and Sand dunes

Sr.No.	Trees	Shrubs/undershrubs	Herbs/grasses
1.	<i>Acacia arabica</i>	<i>Aerva pseudotomentosa</i>	<i>Alternanthera nodiflora</i>
2.		<i>Calotropis procera</i>	<i>Aristolochia bracteata</i>
3.		<i>Capparis caudicifolia</i>	<i>Aerva</i> spp.
4.		<i>Grewia popalifolia</i>	<i>Asparagus</i> spp.
5.		<i>Indigofera</i> spp.	<i>Aristida funiculata</i>
6.		<i>Leptadenia spartium</i>	<i>Boerhaavia diffusa</i>
7.		<i>Lycium barbarum</i>	<i>Citrullus colocynthis</i> (***)
8.		<i>Prosopis spicigera</i>	<i>Clome brachycarpa</i>
9.		<i>Salvadora olioides</i>	<i>Cressa cretica</i>
10.		<i>Crotolaria burhia</i>	<i>Cymbopogon</i> spp.
11.		<i>Sericostoma pauciflorum</i>	<i>Cyperus</i> spp.
12.		<i>Tamarix dioica</i>	<i>Echinochola colona</i>
13.		<i>Zizyphus rotundifolia</i>	<i>Daemia extensa</i>
14.			<i>Eragrostis tenella</i>
15.			<i>Eragrostis ciliaris</i>
16.			<i>Cenchrus catharticus</i>
17.			<i>Farsetia jacquemontii</i>
18.			<i>Ipomea biloba</i>
19.			<i>Indigofera argentea</i>
20.			<i>Launea chondrilloides</i>
21.			<i>Launea nudicaulis</i>
22.			<i>Leucas utricifolia</i>
23.			<i>Leptadenia spartium</i>
24.			<i>Momordica balsamina</i>
25.			<i>Maerua arenaria</i>
26.			<i>Pentatropis</i> spp.
27.			<i>Panicum turgidura</i>
28.			<i>Pennisetum cenchroides</i>
29.			<i>Rhyncosia arenaria</i>
30.			<i>Sonchus oleraccus</i>
31.			<i>Trianthema monogyna</i>
32.			<i>Zygophyllum simplex</i>

Table 4: Trees, Shrubs and Under-shrubs of Kohistan and the Hilly Regions of Sindh

Sr.No.	Trees	Shrubs/undershrubs	Herbs/grasses
1	<i>Acacia arabica</i>	<i>Abutilon glaucum</i>	<i>Agrostis spp</i>
2	<i>Acacia senegal</i>	<i>Abutilon indicum</i>	<i>Aristida scoparia</i>
3		<i>Abutilon muticum</i>	<i>Clome brachycarpa</i>
4		<i>Aerva psudotomentosa</i>	<i>Cleome viscosa</i>
5		<i>Aerva tomentosa</i>	<i>Convolvulus glomeratus</i>
6		<i>Astragalus stocksii</i>	<i>Eragrostis ciliaris</i>
7		<i>Capparis aphylla</i>	<i>Euphobia hirta</i>
8		<i>Commiphora mukul(***)</i>	<i>Euphobia thymifolia</i>
9		<i>Cordia rothii</i>	<i>Hliotropium undulatum</i>
10		<i>Crotolaria burhia</i>	<i>Inula grantioides</i>
11		<i>Daemia extensa</i>	<i>Kickxia incana</i>
12		<i>Euphorbia caudicifolia</i>	<i>Launea spp</i>
13		<i>Grewia populifolia</i>	<i>Melhanian denhamii</i>
14		<i>Grewia vilosa</i>	<i>Mollugo hirta</i>
15		<i>Indigofera pauciflora</i>	<i>Panicum spp</i>
16		<i>Lycium barbarum</i>	<i>Pennisetum cenchroides</i>
17		<i>Mimosa hamata</i>	<i>Portulaca quadrifida</i>
18		<i>Pavonia arabica</i>	<i>Salvia aegyptica</i>
19		<i>Prosopis spicigera</i>	<i>Trianthema pentendra</i>
20		<i>Periploca aphylla</i>	<i>Zygophyllum simplex</i>
21		<i>Rhazya stricta</i>	
22		<i>Salvadora olioides</i>	
23		<i>Senera incana</i>	
24		<i>Sida grsewoide</i>	
25		<i>Zizyphus rotundifolia</i>	

Appendix 13.1: Animals at the Kirthar National Park (KNP)

Table 1: Census Report of Herbivore Animals at KNP District Dadu (1998-99)

Name of Area / Mountain	Species Sindh Ibex (Capra Hirus)				Species Urial/Wildsheep (Ovisorientlis)			
	Male	Female	Kids Jan 99	Total	Male	Female	Kids Jan 99	Total
Kirthar Mountain	1253	1800	450	3503	129	343	124	596
Jhating Mountain	15	32	08	55	-	-	-	-
Rani Kot	07	28	07	42	-	-	-	-
Kambho East and West	540	1230	218	1988	128	366	72	566
Baneer Mountain	-	-	-	-	30	143	26	199
Dumbar Mountain	50	60	35	145	141	190	109	440
Gaz, Behli, Fatag, Mool and Guri	-	-	-	-	30	45	24	99
Petrok Mountain	-	-	-	-	75	102	61	238
Mehi Mountain	10	32	06	06	06	43	08	57
Total				5781				2195

Table 2: Census of Key Species in KNP (1992-93)

Sr. No.	Name of Mountain	Sindh Ibex	Urial	Chinkara
1.	Kirthar	2001	461	315
2.	Kambar	2110	380	825
3.	Dumbar	-	920	177
4.	Jhating	391	-	-
5.	Mari	1	245	-
6.	Munghtar	-	181	-
7.	Lusar	-	205	-
8.	Jannai	-	119	-
9.	Mehar	-	148	-
10.	Mole Wari Guri	-	89	55
11.	Muso Pipri	-	107	15
	Total	4503	2855	1387

Appendix 14.1: Total Revenues Earned in Rupees from Minerals in Sindh

Table 1: Total Revenues Earned (in Rupees) from Minerals in Sindh

Sr. No.	Mineral	1997- 98	1998 - 99	1999 - 2000
1.	Aragonite/Marble	384,946	119072	220448
2.	Ball clay	4,000	4200	5000
3.	Bentonite	5,440	11090	42552
4.	Celestite	14,325	17875	10560
5.	Chalk	130,307	121068	127208
6.	Clay	---	---	10000
7.	China clay	398,396	296476	328658
8.	Coal	78,803,238	2048950	79387402
9.	Dolomite	3,667,334	1482240	2660940
10.	Fire clay	N. A.	252	---
11.	Flint stone	13,058	6200	11000
12.	Fuller's Earth	180,165	150724	187926
13.	Granite	N. A.	115960	390693
14.	Gypsum	128,203	20000	---
15.	Gravel	231,265	67370	110844
16.	Lake salt	180,384	129924	112137
17.	Laterite	51,766	78372	115696
18.	Limestone	30,984,418	30440437	27243365
19.	Red Ochre	11,820	9030	7050
20.	Sand/Bajri (Sand stone)	78,642	5880	45176
21.	Sea/Solarsalt(Evaporates)	1,332	---	---
22.	Shale clay	1,055,359	942882	392788
23.	Silica sand	316,796	185049	260164
24.	Surface minerals	27,606,525	28293238	33441721
25.	Trona	177,348	160982	173163
26.	Quarry Licence		2,123,986	1802237
Total Sub Total		144,425,067	66,831,257	147,076,728
Others (Rent &Royalty and Toll tax etc).		1,613,993	92,851,563	92,835,010
Total		146,039,060	159,682,820	239,911,738

Source: Directors General Mines and Minerals

Appendix 15.1: Demographic Data Sindh

Table 1: Sindh Basic Demographic Data of Sindh 1951 - 1998

Year	Area (Sq. Km)	Population		Population density (persons/sq.km)	Urban population (percentage)	Average annual growth rate (percentage)	Household size
1951	140,914 (17.7)	6,054,474	17.9	43.0	29.2	3.3	5.8
1961		8,374,032	19.5	59.4	37.8	4.6	
1972		14,158,27	21.7	100.5	40.4	3.6	
1981		919,028,6	22.6	135.0	43.3	2.71	
1998		6629,991,161	23.0	212.8	48.9		

Source: Arif Hasan, *Urban Change Scale and Underlying causes - The case of Pakistan*. City Press Karachi. 2002

Table 2: Sindh Population 1901-98 (in thousands)

Census Year	Total	Urban	Rural
		(%)	(%)
1901	3091	276	2815
		8.93	91.07
1911	3499	300	3199
		8.57	91.43
1921	3201	322	2879
		10.06	89.94
1931	3750	427	3323
		11.39	88.61
1941	4381	519	3862
		11.85	88.15
1951	6054	1768	4286
		29.20	70.80
1961	8374	3167	5207
		37.82	62.18
1972	14158	5726	8432
		40.44	59.56
1981	19029	8243	10786
		43.32	56.68
1998	29991	14662	15329
		48.89	51.11

Source: Arif Hasan, *Urban Change Scale and Underlying causes - The case of Pakistan*. City Press Karachi. 2002

Appendix 15.2: Pakistan Main City Population Data 1998

Table 1: Pakistan Main City Population Data 1998

Province/City	Population	Population		Average growth rate (% p.a.)
		(as % of provincial urban)	(as % of provincial total)	
Punjab	Urban: 22,699	100.0	31.3	3.31
Lahore	5,063	22.3	7.0	3.22
Faisalabad	1,977	8.7	2.7	3.48
Rawalpindi	1,406	6.2	1.9	3.41
Gujranwala	1,217	5.4	1.7	3.8
Multan	1,182	5.2	1.6	2.86
5 Main Cities	10,845	48.0	15.0	-
Sindh	Urban: 14,661	100.0	49.0	3.45
Karachi	9,094	62.0	30.0	3.4
Hyderabad	1,151	7.8	3.8	2.5
Sukkur	329	2.2	1.1	2.6
3 Main Cities	10,749	71.0	35.2	-
NWFP	Urban: 2,973	100.0	16.9	3.46
Peshawar	988	33.2	5.6	3.3
Mardan	245	8.2	1.4	3.0
Mangora	174	5.8	1.0	4.1
3 Main Cities	1,407	47.0	8.0	-
Balochistan	Urban: 1,516	100.0	23.3	4.90
Quetta	560	37	8.7	4.0
Khuzdar	93	6	1.4	6.7
Turbat	67	4	0.9	1.5
Chaman	65	4	0.9	4.7
4 Main Cities	785	52.0	12.0	-

Source: Arif Hasan, *Urban Change Scale and Underlying causes - The case of Pakistan*. City Press Karachi. 2002

Appendix 15.3: Physical Conditions in Sindh

Table 1: Physical Conditions - Sindh

Physical conditions	Total		Rural		Urban	
	1980	1998	1980	1998	1981	1998
No. of housing units	2,781,873	5,022,392	-	2,850,989	-	2,171,403
Rental housing (%)	10.72	12.20	1.10	1.55	22.98	26.19
Owned housing (%)	77.04	76.90	85.35	86.00	66.45	64.96
One-room houses (%)	61.02	56.94	72.84	72.69	45.95	36.25
2-4 room houses (%)	8.57	10.64	-	5.03	-	18.01
Persons/housing unit	7.1	6.0	7.1	5.5	7.0	6.8
Persons/room	3.94	3.33	4.73	3.93	3.33	3.09
Electric connections (%)	35.92	70.08	10.94	52.62	67.76	93.00
Piped water in house (%)	20.85	37.17	3.76	13.53	42.63	68.21
Piped water outside house	19.21	4.53	4.90	3.29	37.45	6.17
Separate latrine (%)	-	35.36	-	24.23	74.71	49.97
Shared latrine with other housing unit (%)	-	30.57	-	20.08	9.51	44.33
No latrine (%)	-	34.08	-	55.69	15.79	5.70
RCC roofs (%)	15.94	25.53	1.38	6.44	34.48	50.60

Source: Arif Hasan, *Urban Change Scale and Underlying causes - The case of Pakistan*. City Press Karachi. 2002

Table 2: Physical Conditions- Karachi.

	1980	1998
No. of Housing Units	858,000	1,457,000
Rental Housing	26.40 %	32.48 %
One room houses	44.94 %	30.09 %
Three room houses	13.96 %	21/12 %
Average persons/ room	3.1	2.89
Electric Connections	65.78 %	93.79 %
Water Connections in house	44.45 %	74.38 %
Water Connections outside house	45.39 %	7.41 %
RCC roofs	42.54 %	56.04 %

Source: Government of Pakistan, *Census Report 1998 and the Housing Census 1980*

Appendix 15.4: Social Indicators of Different Types of Settlements in Karachi

Table 1: A Comparison of Social Indicators of Planned Areas and *Katchi Abadis* of Karachi

	Planned Areas	<i>Katchi abadi</i> Areas
Demography:		
- Average household size	6.9	7.3
- Percentage gender distribution (male)	54.0	65.0
- Percentage gender distribution (female)	46.0	35.0
- Percentage population < 20	48.6	56.4
- Crude birth rate	1.3	3.6
Income:-		
- Average income (Rs per month)	3,808 - 4,930	1,899 - 2,158
Education:		
- Percentage population literate > 10 years	76.0	48-67
- Percentage population with primary education	60.1	45.4
- Percentage population with up to secondary education	50.6	23.7
- Percentage population with up to intermediate education	30.8	7.4
- Percentage population with up to Bachelor and above	19.1	3.1
- Percentage primary enrolment (male)	87.0	60.0
- Percentage primary enrolment (female)	83.0	49.0

Source: AERC Survey for the Karachi Master Plan, 1989

Table 2: A Comparison of Social Indicators in Low Income Settlements of Karachi

	Peri-Urban ISD (Orangi)	Lower Middle Income Planned Area (Karimabad)	ISD near City Centre (Essa Nagri)	Baba Island (200- year-old settlement)
Year Survey Conducted	1984	1984-85	1986-87	1989
Average number of persons per housing unit	7.6	5.1	6.7	7.3
Average number of rooms per housing unit	2.0	2.9	1.7	2.3
Average number of persons per room	3.8	1.8	4.2	3.2
Percentage population age 10+ literate	73.0	92.6	54.2	19.6
Average family income per month (Rs.)	1,490	2,400	1,535	2,309
Percentage Origin of head of family: Native (Karachi)	0.0	0.0	16.3	88.1
Crude birth rate (per 1000 population.)	40.8	16.3	44.4	39.2
Crude death rate (per 1000 population)	9.6	7.3	10.9	20.0
Infant mortality rate (per 1000 live births)	110.4	33.3	105.0	208.9

Source: Community Health Sciences Department, Aga Khan Medical University, Karachi

Crude Oil Reserves as on June 30, 2001 (Million US Barrels)

Sr. No.	Field	Operator Company	Original Recoverable Reserves	Cumulative Production	Balance
1.	Balkassar	POL	35.2	33.610	1.59
2.	Dhulian	"	42.5	41.540	0.96
3.	Joyamair	"	10.45	7.5	2.95
4.	Khaur	"	4.31	4.20	0.11
5.	Meyal	"	40.30	38.59	1.71
6.	Minwal	"	3.74	0.53	3.21
7.	Pariwali	"	6.77	2.14	4.63
8.	Pindori	"	28.07	5.78	22.29
9.	Turkwai	POL	3.79	1.61	2.18
10.	Bagla	OGDC	0.07	0.00	0.07
11.	Bhal Syedan	"	0.17	0.092	0.08
12.	Bobi	"	8.4	1.978	6.422
13.	Buzdar & Buzdar North ©	"	0.276	0.014	0.262
14.	Chak Dim South	"	0.118	-	0.118
15.	Chak Naurang	"	5.8	4.576	1.224
16.	Dakhni ©	"	10.556	3.021	7.535
17.	Daru	"	0.425	0.215	0.21
18.	Dhamraki	"	0.15	-	0.15
19.	Dhodak ©	"	29.8	5.943	23.857
20.	Fimkassar	"	26.29	12.035	14.255
21.	Jakhro	"	0.31	0.	0.31
22.	Kal	"	7.03	3.627	3.403
23.	Kunar	"	12.4	3.521	8.879
24.	Lashari Centre	"	10.93	6.206	4.724
25.	Chanda	"	18.57	0.02	18.55
26.	Lashari South ©	"	0.04	0.022	0.022
27.	Missan	"	0.314	0.238	0.076
28.	Missakaswal	"	9.33	8.694	0.636
29.	Mithrao	"	1.050	-	1.050
30.	Palli	"	0.25	0.107	0.143
31.	Nur	"	0.057	-	0.057
32.	Pasakhi & Pasakhi North	"	24.68	15.793	8.887
33.	Qadirpur	"	3.8	0.589	3.211
34.	Rajjan	"	17.48	2.98	14.5
35.	Sadkal ©	"	4.5	3.755	0.745
36.	Sono	"	18.6	9.453	9.147
37.	Tando Alam	"	22.419	11.914	10.505
38.	Thora	"	22.98	13.334	9.646
39.	Toot	"	17.4	12.178	5.222
40.	Akri North	UTP	7.512	3.885	3.627
41.	Bachal	UTP	0.031	0.026	0.005
42.	Bari	"	2.376	2.132	0.244
43.	Bhatti ©	"	2.843	1.506	1.337
44.	Bukhari	"	1.642	1.464	0.178
45.	Bizdar South & Deep	"	0.242	.177	.065

Sr. No.	Field	Operator Company	Original Recoverable Reserves	Cumulative Production	Balance
46.	Dabhi & South		9.693	6.512	3.181
47.	Duphri		0.025	-	0.025
48.	Ghungro	"	10.337	3.603	6.734
49.	Golarchi ©	"	0.242	.177	.065
50.	Halipota	"	1.783	1.112	.671
51.	Jabo	"	5.094	0.491	4.603
52.	Jagir	"	5.618	2.577	3.041
53.	Jalal	"	.311	.248	.063
54.	Kato	"	.251	.227	.024
55.	Khasheli		11.385	10.979	0.406
56.	Khorewah & Deep	"	1.761	1.209	.552
57.	Koli ©	"	.456	.423	.033
58.	Laghari	"	21.253	20.998	.255
59.	Liari	"	11.902	6.488	5.414
60.	Mahi	"	0.048	0.025	0.023
61.	Matli	"	0.286	.283	.003
62.	Mazari	"	22.479	21.231	1.248
63.	Mazari South	"	26.777	16.472	10.305
64.	Meyun Ismail Deep	UTP	0.882	0.791	0.091
65.	Meyun Ismail	"	0.419	0.346	0.073
66.	Mokhdum pur Deep	"	0.419	0.346	0.073
67.	Muban	"	1.571	0.093	1.478
68.	Nakruji,	"			0.00
69.	Nari	"	0.085	.053	.032
70.	Paniro	"	1.241	0.669	0.572
71.	Pir	"	0.089	.061	.028
72.	Raj	"	.038	-	.038
73.	Rind ©	"	0.321	.228	0.093
74.	Sakhi	"	7.648	2.486	5.162
75.	Sonro ©	"	.965	.491	0.474
76.	Tajedi	"	2.125	1.862	.263
77.	Tangri	"	15.969	6.964	9.005
78.	Tando Gulam Ali	"	0.072	-	0.072
79.	Turk & Turk Deep	"	2.144	1.681	0.463
80.	Zaur & Zaur Deep	"	2.025	0.264	1.761
81.	Bhangali	OXY	3.68	3.21	0.47
82.	Dhurnal	"	50.29	48.57	1.72
83.	Ratana	"	1.2	1.14	0.06
84.	Savi Ragha ©	BG	1.35	-	1.35
85.	Adhi	PPL	35.0	10.76	24.24
86.	Dhabi North	UTP	5.925	2.677	3.248
87.	Jhaberi	UTP	0.135	0	0.135
88.	Junathi South	UTP	0.077	0.006	0.071
89.	Keyhole G	UTP	0.969	0.06	0.909
90.	Zamzama ©	BHP	6.835	0.048	6.787

GOVERNMENT OF SINDH

MINISTRY OF LAW, JUSTICE, HUMAN RIGHTS AND
PARLIAMENTARY AFFAIRS (LAW, JUSTICE AND HUMAN RIGHTS
DIVISION)

F. NO. 8 (10)/2002-Pub.

Karachi, 26th December 2002

The following Ordinance promulgated by the Governor is hereby published for general information:

ORDINANCE NO. X OF 2002

AN
ORDINANCE

On Development of Renewable Energy Technologies in Sindh
(This ordinance is complimentary to all National ordinances on renewable energy)

WHEREAS the province of Sindh has tremendous Solar and Wind energy resources that have not been explored to their full extent, and that these energy resources can be swiftly developed to meet pressing energy demands of widely dispersed populace, the Sindh Government has decided to introduce Renewable Energy Technologies with a special Ordinance to ensure their speedy development;

AND WHEREAS the acute shortage of energy resources in remote locations in the Province of Sindh have not been met by conventional energy resources despite the best efforts of all energy development agencies;

AND WHEREAS the Governor of Sindh is convinced that there is an urgent requirement to investigate alternative means that can provide efficient energy mix to masses living in remote areas of Sindh;

NOW THEREFORE, in pursuance of the Proclamation of Emergency of the fourteenth day of October, 1999, and the Provisional Constitution Order No 1. of 1999, read with the Provisional Constitution (Amendment) Order No. 9 of 1999, and in exercise of all powers enabling him in that behalf, the Governor of Sindh is pleased make and promulgate the following Ordinance to this effect.

CHAPTER I
GENERAL

Short Title, extent and commencement.-

- (1) "This Ordinance may be called Sindh Ordinance on Development of Renewable Energy Resources 2002.
- (2) It shall extend to the whole of Sindh.
- (3) It shall come in to force at once.

Definitions: -

1. Renewable energy technology means technologies that utilize non-polluting, environmental friendly and naturally occurring sources of energy;
2. Renewable energy sources will include solar, wind, micro-hyde power, energy from oceans, biomass, biogas and other similar energy resources.

CHAPTER II RENEWABLE ENERGY GROWTH TARGETS AND INCENTIVES

The Government of Sindh has set following targets to be achieved to ensure introduction of renewable energy resources in the Province.

All electrical energy generation companies/electrical energy distribution companies operating in Sindh will ensure that 1 to 2 percent of annual electricity generated on their grid is produced with 'Renewable Energy Resources'. The energy production through renewable energy resources shall be developed at a pace so as to achieve 10 percent share in electrical generation of the province by the year 2010.

To achieve bold and ambitious target of 10 percent share of renewable energy resources in electrical grid by the year 2010, a 2 percent of the Annual Development Budget will be reserved for the acquisition, exploitation and application of Renewable Energy Resources in the Province.

This reserved component of the budget will be allocated for projects selected by Sindh Irrigation and Power Department and National Commission on Alternative Energy.

The villages electrification program of the provincial government will be modified in such a way that 20 percent of the villages will be connected to renewable energy power in next Five-Year Plan.

All new schools, mosques and medical facilities in villages of Province of Sindh will be provided electrical power by renewable energy resources only.

All new public buildings will be required to install solar hot water heaters manufactured in Pakistan, before receiving a completion certificate from the authorities.

All schools, colleges, polytechnic institutes, and universities will introduce renewable energy technology courses to produce the necessary manpower needed for development, promotion of local industries and support for development of local communities, infrastructures, etc.

The Government of Sindh will offer following incentives to ensure continued support to entrepreneur in this sector:-

No provincial taxes will be imposed on equipment, machinery and raw materials needed for the development, promotion and implementation of renewable energy technologies for a period of 10 years.

A Governors Renewable Energy Technologies Development Fund will be created with 50 per cent share from provincial government and 50 percent will be requested from Government of Pakistan. Allocation of Rs. 50 million will be made out of Annual Development Budget of the Province till year

2010.

- Micro credit banks will be entrusted to provide renewable energy operated products on easy instalments like solar cookers and solar lanterns through the network of NGO's or directly as deemed necessary;
- Banks will be encouraged to provide loans to retailers of Renewable Energy Products on easy terms and conditions to enable them to build up their business;
- Provide grants and support to initiate the required training schemes;
- All subsidies provided for kerosene and other fossil fuels for irrigation and drinking water pumping will be shifted to subsidize the renewable power systems by the year 2005;
- Encourage private and public industries to utilize renewable energy products in promotion and advertisement of their products.

Provide grants and support to initiate the curriculum development at all level that is required for training schemes and provide grants and support to all education institutions for scholarships to students for studying renewable energy technologies degree program.

The Government of Sindh will facilitate contractual agreements on production of power by the National Commission on Renewable Energy in Sindh and provide land for development of Renewable Energy technologies in the Province.

A Governor's Renewable Energy Technology Scholarship will be created for all schools, colleges and universities to be awarded to one student from each institution working on Renewable Energy Technologies.

pecial development grant will be awarded each year to an institute developing state of the art research facilities to train scientists and engineers in renewable energy technologies.

Special development grant will be awarded each year to an institute developing state of the art research facilities to train scientists and engineers in renewable energy technologies.

Appendix 22.1 : Sindh Based Print Media Publications

Table 1: Daily Newspapers

Language	Number of Publications
Urdu	48
Sindhi	20
English	14
Gujarati	1
Joint U/S/E/G	6
Total	89

Table 2: Weekly Publications

Language	Number of Publications
Urdu	60
Sindhi	6
English	8
Seraiki	1
Joint U/S/E	18
Total	93

Table 3: Monthly Publications

Language	Number of Publications
Urdu	126
Sindhi	7
English	57
Gujarati	1
Joint U/S/E/G	29
Total	220

Table 4: Fortnightly Publications

Language	Number of Publications
Urdu	19
Sindhi	1
English	7
Seraiki	1
Joint U/S/E/G	9
Total	37

Table 5: Quarterly Publications

Language	Number of Publications
Urdu	4
English	7
Joint U/E/S	2
Total	13

Table 6: Bi- Annual Publications

Language	Number of Publications
Urdu	2
Total	2

Table 7: Annual Publications

Language	Number of Publications
English	1
Total	1

Source: Information Department, Government of Sindh.

The Role of Pakistan Electronic Media Regulatory Authority (PEMRA)

PEMRA, the regulator for electronic media in Pakistan, has been made responsible for formulating technical standard and scrutinising technical feasibility for broadcasting services including radio, television, satellite broadcasting, cable television, multi-channel multi-point distribution service (MMDS) and local multi-point distribution service (LMDS).

According to PEMRA Ordinance 2002, the Authority has been mandated to: Improve the standards of information, education and entertainment; Enlarge the choice available to the people of Pakistan in the media; Facilitate the devolution of responsibility and power to the grassroots by improving the access of the people to mass media at the local and community level; and Ensure accountability, transparency and good governance by optimising the free flow of information.

PEMRA has been mandated to provide project management guidelines and action plans to the private sector interested in establishing radio, television and cable TV stations in the country.

The Authority has been empowered to issue licences for broadcast and CTV stations in the following categories: i) International scale stations; ii) National scale stations; iii) Provincial scale stations; iv) Local Area or Community based stations; v) Specific and specialised subject stations; and vi) Cable television network stations.

The law lays down stringent and subjective pre-conditions for eligibility of a license. It says a broadcaster or CTV operator issued a licence under this Ordinance must, among others, guarantee the following: Respect the sovereignty, security and integrity of Pakistan; Respect the national, cultural, social and religious values and the principles of public policy as enshrined in the Constitution; and Ensure that programmes and advertisements do not encourage violence, terrorism, racial, ethnic or religious discrimination, sectarianism, extremism, militancy or hatred or contains pornography or other material offensive to commonly accepted standards of decency.

Apportioning Airtime

Significantly, it will be binding on a licensed broadcaster to allot at least 10 percent of its daily airtime to broadcast programmes given to it by the government. The law says a licensee must "broadcast or distribute programmes in the public interest specified by the Federal Government or the Authority in the manner indicated by the Government or, as the case may be, the Authority, provided that the duration of such mandatory programmes do not exceed 10 percent of the total duration of broadcast or operation by a station in 24 hours except if, by its own volition, a station chooses to broadcast or distribute such content for a longer duration."

One shortcoming of the law is that even after a broadcaster has been issued a license by PEMRA after paying a heavy fee, he or she will have to obtain separate licences from the Pakistan telecommunications Authority (PTA) and the Frequency Allocation Board (FAB) before being eligible to import any transmitting apparatus for broadcasting or CTV operation system. Ideally all of this should have been under one roof. Currently a broadcaster is not guaranteed operational freedom even after obtaining a license from PEMRA. And then a licence will be valid for a period of five, 10 or 15 years subject to payment of the annual fee prescribed from time to time.

The law also outlines the ineligibility criteria under which foreigners or foreign firms or organisations can neither operate nor fund a radio or television station. A licence will NOT be granted to: i) A person who is not a citizen of Pakistan or resident in Pakistan; ii) A foreign company organised under the laws of any foreign government; iii) A company the majority of whose shares are owned or controlled by foreign nationals or companies whose management or control is vested in foreign nationals or companies; iv) A person who already owns or operates, in Pakistan, any other broadcast or cable TV network station, printed newspaper or magazine or an advertising agency, and v) Any person funded or sponsored by a foreign government or organisation.

Disallowed Programmes

Among the prohibitions on private radio or television include broadcasting, re-broadcasting or distribution of any programme that in the opinion of PEMRA "is likely to create hatred among the people or is prejudicial to the maintenance of law and order or likely to disturb public peace and tranquillity or endangers national security or is pornographic or is offensive to commonly accepted standards of decency."

As for offences and penalties, any broadcaster or CTV operator or person who violates or abets the violation of any of the provisions of this law will be guilty of an offence punishable with a fine which may extend to one million rupees. Where such broadcaster or CTV operator or person repeats the violation or abetment, such person will be guilty of an offence punishable with imprisonment for a term which may extend to three years, or with fine, or with both.

The Pakistan government, however, has included an indemnity in the law for itself. No suit, prosecution or other legal proceeding will be allowed against the federal or any provincial government or local authority or any other person exercising any power or performing any function under this law "or for anything which is in good faith done or purporting or intended to be done under this Ordinance or any rule made thereunder."

All these rules show that operating a radio or television station in the private sector in Pakistan will not be an easy task and some of the main problems will be huge operational funds, an absence of formal professional training for technical and production staff and the omnipresent government interference, influence and control.

NGO Networks and Alliances

To network and complement the work of each other, many NGOs in Sindh have formed alliances. These are as follows:

Sindh NGO Federation

Registered with the Social Welfare Department, Government of Sindh, the Sindh NGO Federation (SINGOF) was established in 1995. Based in Hyderabad, it has at present, 394 members. This network was a result of an NGO convention held in Hyderabad, in 1994, which was attended by 280 representatives from 150 registered NGOs and CBOs. It was there that the need for such a coalition was propounded.

The objectives of SINGOF are to establish a link with other NGOs and support organizations, provide training to CBOs working at grassroots and bridge the gap between NGOs support organizations and the government.

The SINGOF played a major role in negotiating with the government on the proposed amendments in the Social Welfare Act.

Sindhnet

Formed by a network of support organizations in 1994, its founding members include NGO Resource Centre, NGO Support unit of IUCN, National Rural Support Programme, OXFAM, Strengthening Participatory Organization (SPO) and Trust for Voluntary Organization (TVO). Recently Health and Nutrition Development Society (HANDS). Thardeep Rural Development Programme (TRDP), and Sindh Graduates Association (SGA) also joined the coalition.

The objectives are building the capacity of CBOS/NGOs as well as SINDNET members, sharing of ideas on developmental issues and approaches, preventing conflicts, duplication by fostering greater collaboration, developing consensus for policy dialogues among its members and advocating and lobbying for the cause of local NGOs with the government, donors and international NGOs.

The secretariat is shared by all the member organizations on a rotational basis.

Marooara Coordination Council

A forum made of 40 government and NGO bodies way back in 1993, the council is working primarily in the arid zones of Sindh and has its headquarters in Mithi. It was initiated to strengthen the capacity of local NGOs/CBOs, share experiences and carry out activities with the help of the lines department's resources.

Sindh Goth Sudhar Sangat (SGSS)

Established in 1983, it includes academics, development professionals, journalists and social workers and has a network of about 200 branches spread all across Sindh. Its basic aim is rural

development through empowerment. Its central office is in Jamshoro and is engaged in the capacity building of its partners through information networking and sharing of ideas.

Bhit Shah Declaration Coordinating Council

While conducting a training programme for capacity building of NGOs in 1991-92 with South Asia Partnership, the participants decided to form a coalition based on a shared vision of development and social change that they could bring about through working from one platform. Starting off with 26 citizen organizations, it has grown to include 53 community based NGOs and has its office in Hyderabad.

Rural Development Organization's Coordinating Council (RDOCC)

This was formed in 1994 to serve District Ghotki and Sukkur division. Starting off with 17 community based NGOs, it has grown into a 23-member network including nine women organizations and one working for children.

The RDOCC provides a forum for partner organizations, cooperative and women organizations to strive for the promotion of participatory, integrated and sustainable development.

It recently conducted a training programme, Development Orientation and Planning Project, with technical assistance from the Democratic Commission for Human Development (DCHD), Lahore. The Rural Model School is another programme through which it strives to improve the educational standard of selected schools by involving the community.

Important NGOs in Sindh and their Areas of Work

NGO	Established in	Geographical Focus	Area of Operation	Thematic Area
Aga Khan Health Services, Pakistan (AKHSP)	1924	Rural	Sukkur, Hyderabad, Mirpurkhas, Karachi	Governance, health, information dissemination, research, technology, women
All Pakistan Women's Association (APWA)	1949	Rural / Urban	Sukkur, Hyderabad, Karachi	Advocacy, education, health, human rights, humanitarian relief, information dissemination, infrastructure development, rural development, women, youth activities
Association for Rational Use of Medication in Pakistan - The Network	1992	Rural / Urban	Larkana, Sukkur, Hyderabad, Mirpurkhas, Karachi	Advocacy, consumer protection, health, human rights, information dissemination, research
Aurat Foundation	1986	Rural/ Urban	Karachi	Advocacy, agriculture, communications and media, development, disadvantaged groups, economy, emergency relief, food production, governance, human rights, humanitarian relief, information dissemination, infrastructure development, institution building/strengthening, research, women
Baanhn Beli	1987	Rural/ Urban	Mirpurkhas, Karachi	Advocacy, agriculture, child labour and child rights, communications and media, credit systems, education, emergency relief, environment and natural resource management, health, human rights, institution building/strengthening, research, rural development, women
Behbud Association	1970	Karachi	Urban	Credit systems, drug abuse, education, emergency relief, environment/natural resource management, health, human rights, humanitarian relief, institution building/strengthening, poverty alleviation, research, women, youth activities
The Book Group	1988	Rural / Urban	Karachi	Education, research
Basic Urban Services for Katchi Abadis (BUSTI)	1986	Rural/ Urban	Larkana, Sukkur, Hyderabad, Karachi	Advocacy, children, credit system development, disadvantaged groups, drug demand reduction, economy, education, food production, health, infrastructure development, institution. building/strengthening, poverty alleviation, research, women

NGO	Established in	Geographical Focus	Area of Operation	Thematic Area
Catholic Social Services	1963	Urban	Karachi	Child labour and child rights, credit system, education, env/natural resource management, institution building / strengthening, poverty alleviation, women, youth activities
Citizen-Police Liaison Committee (CPLC)	1989	Urban	Larkana, Sukkur, Hyderabad, Mirpukhas, Karachi	Advocacy, governance, human rights, law enforcement
Community Development Network forum (CDNF)	1995	Rural/Urban	Larkana	Advocacy, child labour and child rights, credit system, education, emergency relief, env/natural resource management, health, human rights, rural development, women
Concern for Children Trust(CFC)	1997	Urban	Karachi	Children, development, education, health, information dissemination, research
Education Foundation	1995	Urban	Hyderabad, Karachi	Advocacy, child labour and child rights, education, human rights, research
Family Planning Association of Pakistan	1953	Rural/Urban	Hyderabad, Mirpurkhas, Karachi	Advocacy, children, education, env/natural resource management, governance, health, RH, information dissemination, infrastructure development, institution building, poverty alleviation, research, women, youth activities
Faran Educational Society (FES)	1975	Rural/Urban	Karachi	Advocacy, business, municipal facilities improvement, community mobilization, credit system, education, human rights, infrastructure improvement, poverty alleviation, research, youth activities
Gul Bahao	1994	Rural/Urban	Karachi	Advocacy, agriculture, business, env/natural resource management, information dissemination, poverty alleviation, research, technology
Health and Nutrition Development Society (HANDS)	1979	Rural	Sukkur, Hyderabad, Mirpukhas, Karachi	Advocacy, agriculture, child labour and child rights, credit system, drug abuse, education emergency relief, energy, env/natural resource management, governance, health, human rights, humanitarian relief, information dissemination, infrastructure development, institution building/strengthening, poverty alleviation, research, rural development, women, youth activities

NGO	Established in	Geographical Focus	Area of Operation	Thematic Area
Health Oriented Preventive Education (HOPE)	1997	Rural/Urban	Larkana, Sukkur, Hyderabad, Mirpurkhas, Karachi	Advocacy, children, communications and media, education emergency relief, health, poverty alleviation, research, rural development, women, youth activities
Human Rights Commission of Pakistan (HRCP)	1986	Rural/Urban	Larkana, Sukkur, Hyderabad, Mirpurkhas, Karachi	Advocacy, child labour and child rights, communications and media, env/natural resource management, governance, human rights, industrial relations/labour, information dissemination, research, women, youth activities
Idara-e-Amn-o-Insaf	1972	Urban	Hyderabad, Karachi	Advocacy, child labour and child rights, governance, human rights, industrial relations/labour, women
Institute of Social Research and Development (ISRD)	1988	Rural/Urban	Larkana, Sukkur, Hyderabad, Mirpurkhas, Karachi	Advocacy, child labour and child rights, education, health, information dissemination, poverty alleviation, research, rural development, women, youth activities
Karachi Administration Women Welfare Society (KAWWS)	1988	Urban	Karachi	Env/natural resource management, governance, health, infrastructure development, institution, building/strengthening
Lawyers for Human Rights and Legal Aid (LHRLA)	1990	Urban	National	Advocacy, child labour and child rights, governance, human rights, industrial relations/labour (working women), information dissemination, institution building/strengthening, legal aid, legal education, research, women issues
Lower Sindh Rural Development Association (LSRDA)	1975	Rural	Mirpurkhas	Advocacy, agriculture, credit system, education, emergency relief, env/natural resource management, health, poverty alleviation, research, rural development, women
Marie Stopes Society (MSS)	1990	Rural/Urban	Sukkur, Karachi	Advocacy, health
Maternity and Child Welfare Association of Pakistan (MCWAP)	1961	Rural/Urban	Larkana, Sukkur, Hyderabad, Mirpurkhas	Children, health/RH, research, women
National Rural Support Programme (NRSP)	1991	Rural	Mirpurkhas	Credit system, education env/natural resource management, infrastructure development, institution building/strengthening, poverty alleviation, research, rural development, women

NGO	Established in	Geographical Focus	Area of Operation	Thematic Area
Naz High School Old Boys Welfare Association	1981	Rural/Urban	Sukkur	Advocacy, education, humanitarian relief, information dissemination, institution building/strengthening, research
NGO Resource Center (NGORC)	1990	Rural/Urban	National	Advocacy, governance, information dissemination, institution building/strengthening, research
Orangi Pilot Project-Orangi Charity Trust (OPP-OCT)	1985	Rural/Urban	Larkana, Hyderabad, Karachi, Thatta, Badin	Agriculture, business, credit system, poverty alleviation, research, rural development
OPP- Research and Training Institute (OPP-RTI)	1980	Urban	Karachi	Advocacy, education, env/natural resource management, governance, health, institution building/strengthening, research, technology, youth activities
OPP-Karachi Health and Development Association (OPP-KHASDA)	1985	Urban	Karachi	Health, infrastructure development, research
Pakistan Crescent Youth Organization	1986	Rural/Urban	Hyderabad, Mirpurkhas Karachi	Advocacy, communications and media, credit system, drug abuse, env/natural resource management, health, human rights, youth activities
Pakistan Voluntary Health and Nutrition Association (PAVHNA)	1979	Rural/Urban	Larkana, Karachi	Advocacy, children, FP service delivery, health, information dissemination, RH, research, training(HRD), women, youth activities
Pakistan Federation of Business and Professional Women (PFBPWO)	1954	Urban	Hyderabad, Karachi	Children (day care center), culture (auditorium), education (pre-primary), health (medical center), institution building/strengthening, women
Pakistan Institute of Labour Education and Research (PILER)	1982	Urban	Larkana, Sukkur, Hyderabad, Karachi	Advocacy, children, disadvantaged groups, education, env/natural resource management, human rights, industrial relations, information dissemination, research, women

NGO	Established in	Geographical Focus	Area of Operation	Thematic Area
Participatory Village Development Programme (PVDP)	1997	Rural	Mirpurkhas	Advocacy, agriculture, credit system, education, emergency relief, env/natural resource management, health, poverty alleviation, rural development
Pakistan Women Lawyers' Association (PAWLA)	1980	Rural/ Urban	Karachi, Interior Sindh	Advocacy, children, culture, development, disadvantaged groups, education, governance, human rights, information dissemination, institution building/strenghtneing, legalaid/awareness, law reforms, poverty alleviation, women
Pattan	1993	Urban	Hyderabad, Dadu	Advocacy, agriculture, credit system, culture, development, disaster management/mitigation, education, emergency relief, env/natural resource management, food security, governance, health, information dissemination, infrastructure building/strengthening, poverty alleviation, religion, research, rural development, women
Sahil	1995	Rural/ Urban	Sukkur, Hyderabad, Karachi	Advocacy, business, children, communication and media, education, health, human rights, institution building/strengthening, refuge for children, research
Shehri-Citizens for a Better Environment	1988	Urban	Karachi	Advocacy, communication and media, env/natural resource management, governance, human rights, info dissemination, infrastructure development, institution building/strengthening, research, technology, youth activities
Shirkat Gah, Women's Resource Center	1975	Rural/ Urban	Hyderabad, Karachi	Advocacy, economy, env/natural resource management, governance, human rights, income generation, information dissemination/publications, legal reforms and legal awareness, poverty alleviation, RH, research, women issues
Sindh Agricultural & Forestry Worker's Coordinating Organization	1986	Rural	Mirpurkhas	Advocacy, agriculture, credit system, drug abuse, education, energy, env/natural resource management, health, humanitarian relief, info dissemination, infrastructure development, institution building/strengthening, religion, research, rural development
Sindh Development Society (SDS)	1994	Rural/ Urban	Larkana, Sukkur, Hyderabad, Mirpurkhas	Advocacy, child labour and child rights, education, env/natural resource management, governance, health, human rights, poverty alleviation, rural development, women, youth activities

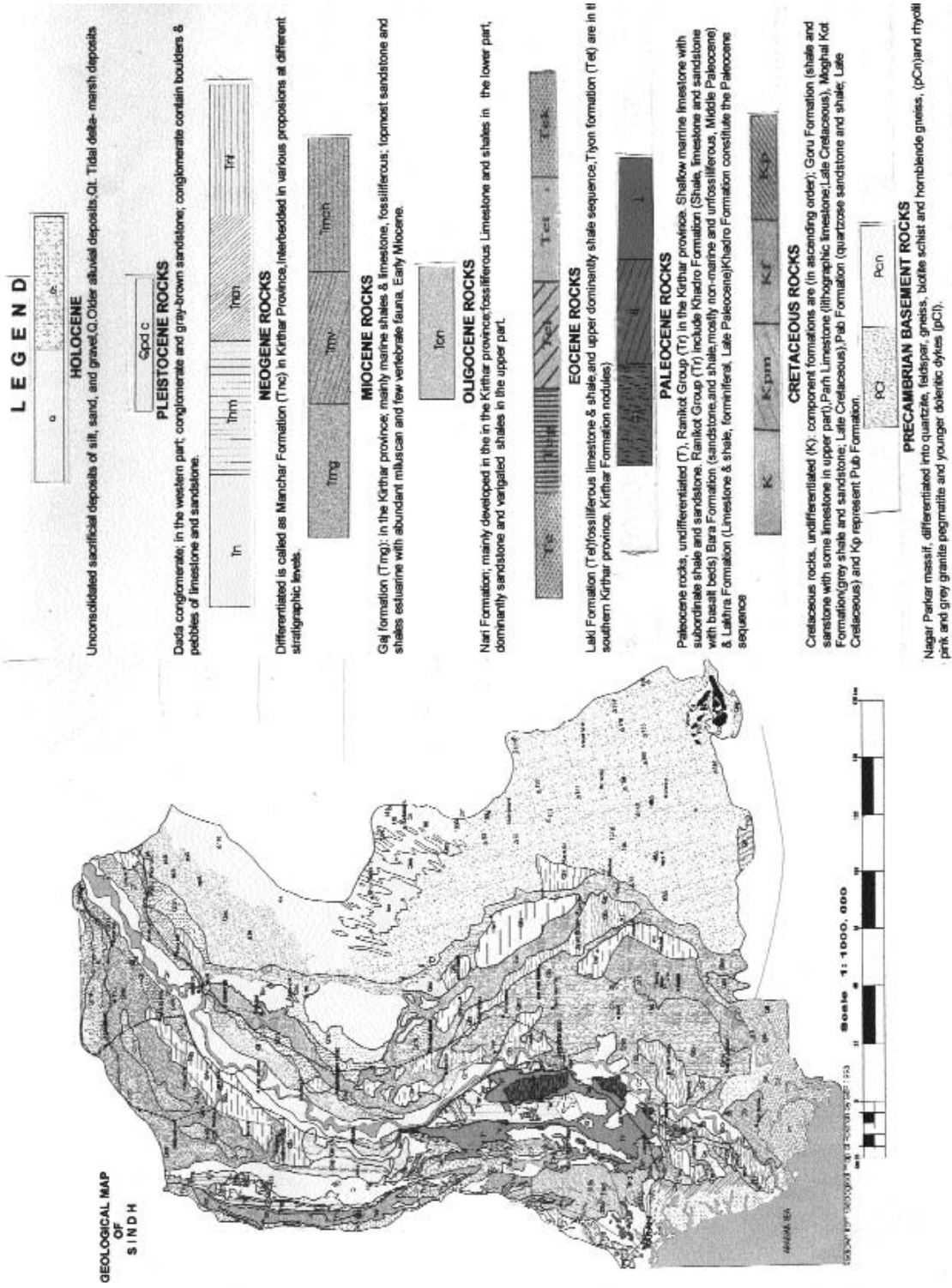
NGO	Established in	Geographical Focus	Area of Operation	Thematic Area
Sindh Graduates Association (SGA)	1972	Rural/Urban	Larkana, Sukkur, Hyderabad, Mirpurkhas	Advocacy, child labour and child rights, credit system, culture, drug abuse, governance, health, humanitarian relief, infrastructure development, research, rural development, women
Social Aid for Education and Development (SAFE)	1995	Rural/Urban	Sukkur	Advocacy, communication and media, education, emergency relief, human rights, humanitarian relief, information dissemination, infrastructure development, institution. building/strengthening, research, rural development, women, youth activities
Social Marketing Pakistan(Guarantee)Limited (SMP)	1991	Urban	National	Advocacy, children, communications and media, health/RH, information dissemination, institution. Building/strengthening, research, women, youth activities
Society for Conservation and Protection of Environment (SCOPE)	1988	Rural/Urban	Thatta, Hyderabad, Mirpurkhas, Karachi	Advocacy, agriculture, communications and media, env/natural resource management, human rights, information dissemination, institution. building/strengthening, poverty alleviation, research, technology
South Asia Partnership, Pakistan (SAP-PK)	1989	Rural/Urban	Larkana, Sukkur, Hyderabad, Mirpurkhas, Karachi	Advocacy, agriculture, child labour and child rights, communications and media, credit system, governance, human rights, institution. building/strengthening, research, women
Strengthening Participatory Organization (SPO)	1984	Rural/Urban	Larkana, Sukkur, Hyderabad, Mirpurkha, Karachi	Advocacy, credit system/micro finance, education, environment/natural resource management, infrastructure development, institution building/strengthening, poverty alleviation, rural development, women issues
Teacher's Resource Center (TRC)	1986	Rural/Urban	Larkana, Sukkur, Hyderabad, Mirpurkha, Karachi	Education
Thardeep Rural Development Programme (TRDP)	1998	Rural	Mirpurkhas	Advocacy, agriculture, child labour and child rights, credit systems, emergency relief, health, inst. building/strengthening, natural resource management, research, rural development, women
Urban Resource Center (URC)	1989	Urban	Karachi	Advocacy, governance, human rights, information dissemination, research
War Against Rape (WAR)	1989	Rural/Urban	Karachi	Child labour and child rights, human rights, women
Young Women Christian Association (YWCA)	1900	Urban	Karachi	Children, credit system, education, health, human rights, humanitarian relief, international relations, religion, women, youth activities





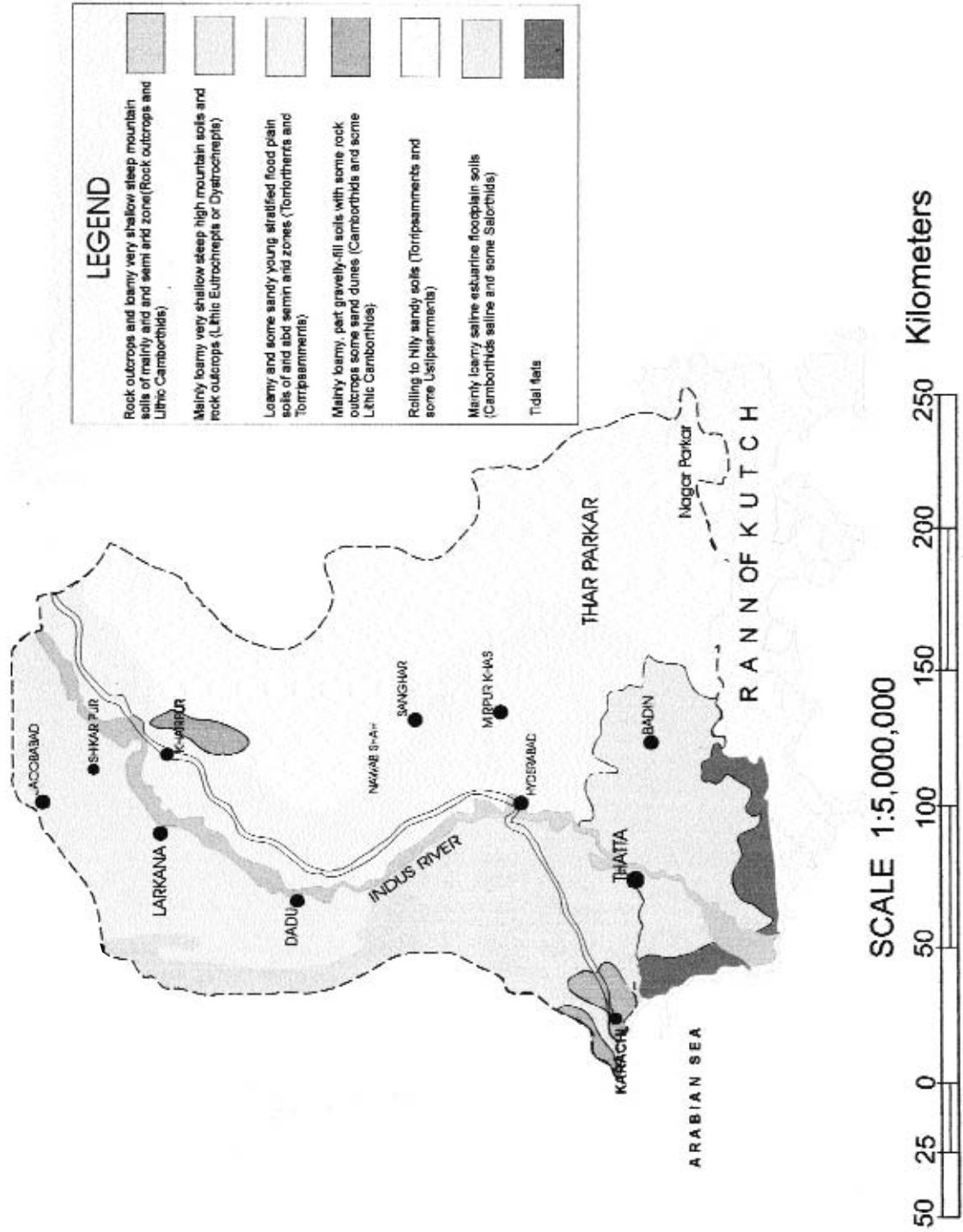
MAPS

Map 2.2 : The geology of Sindh.

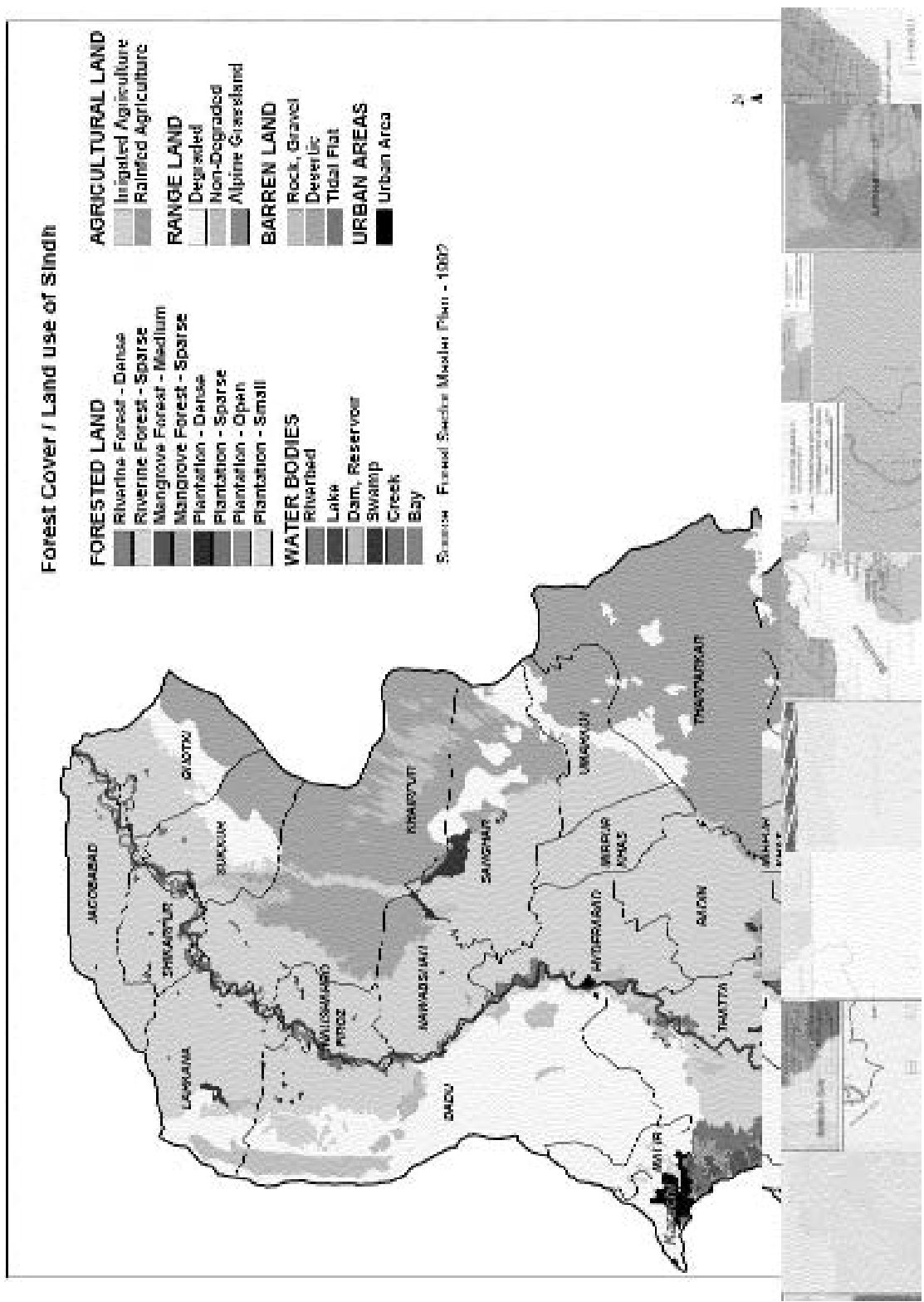


Source: Imdadullah Siddiqui

Map 2.3: Location of different types of Soils in Sindh

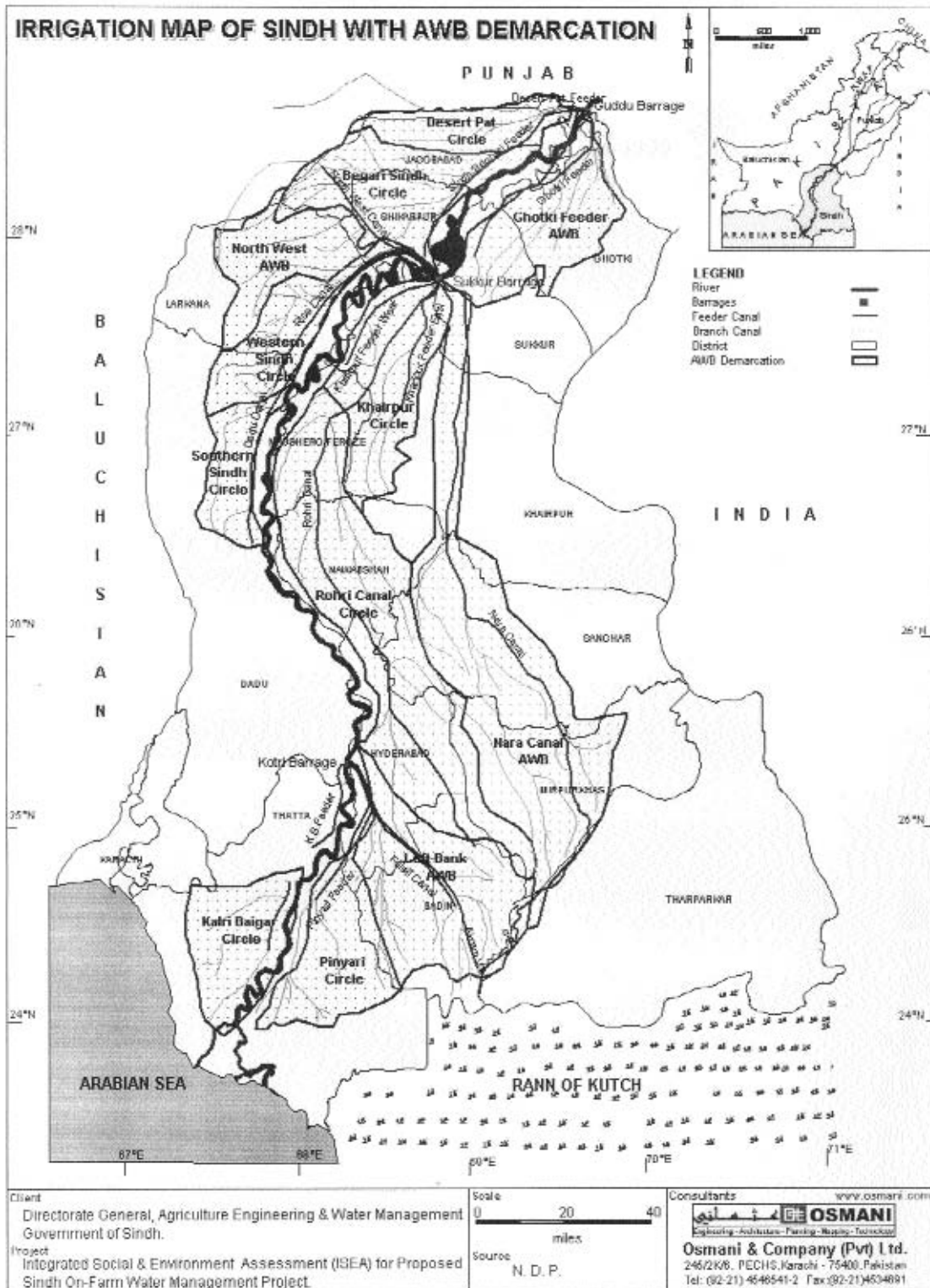


Map 2.5: Land Use of Sindh

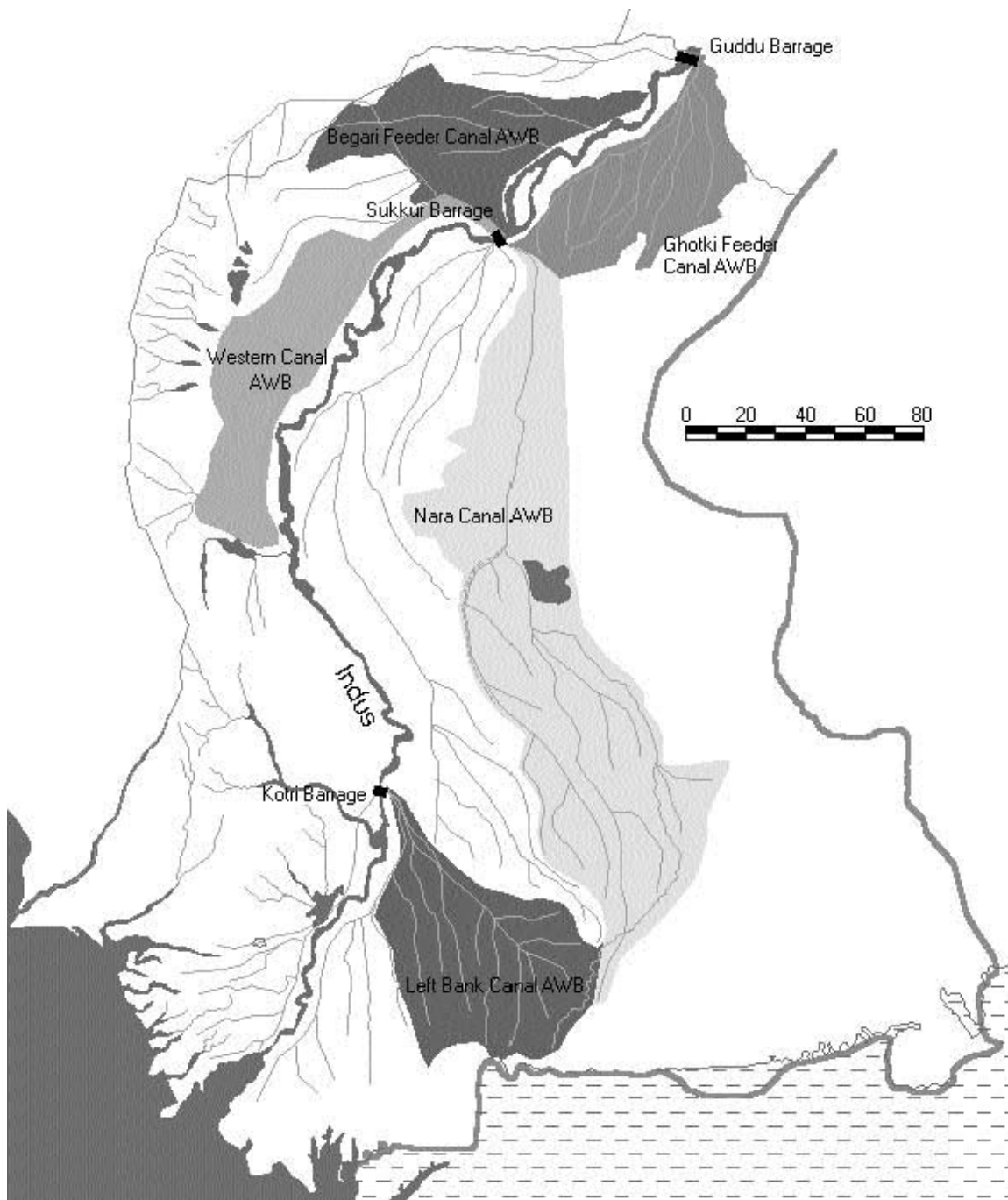


Source: Forest Sector Master Plan - 1992

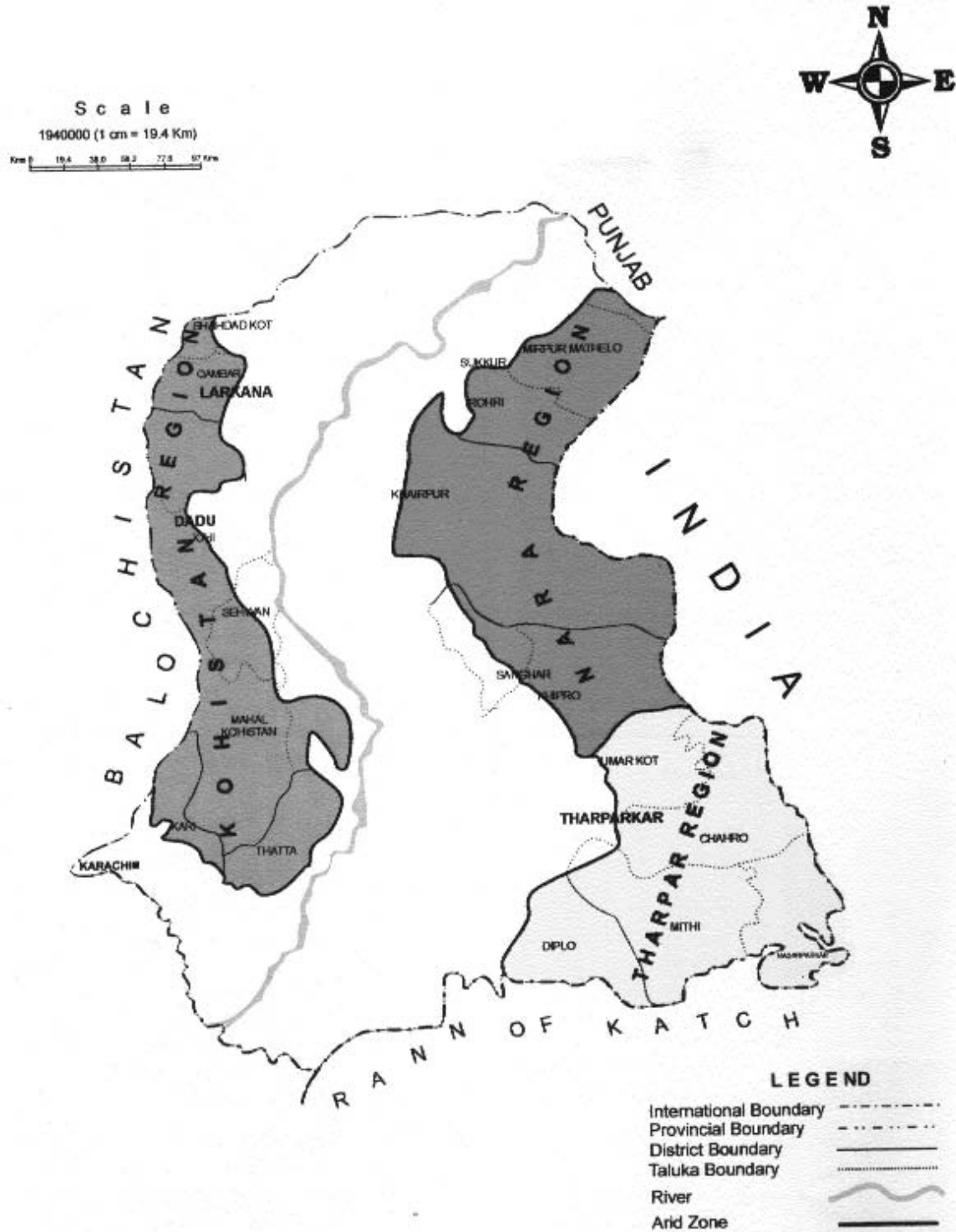
Map 4.2: The Irrigation System in Sindh



Map 4.2: Irrigation System of Sindh - Area Water Board (2)

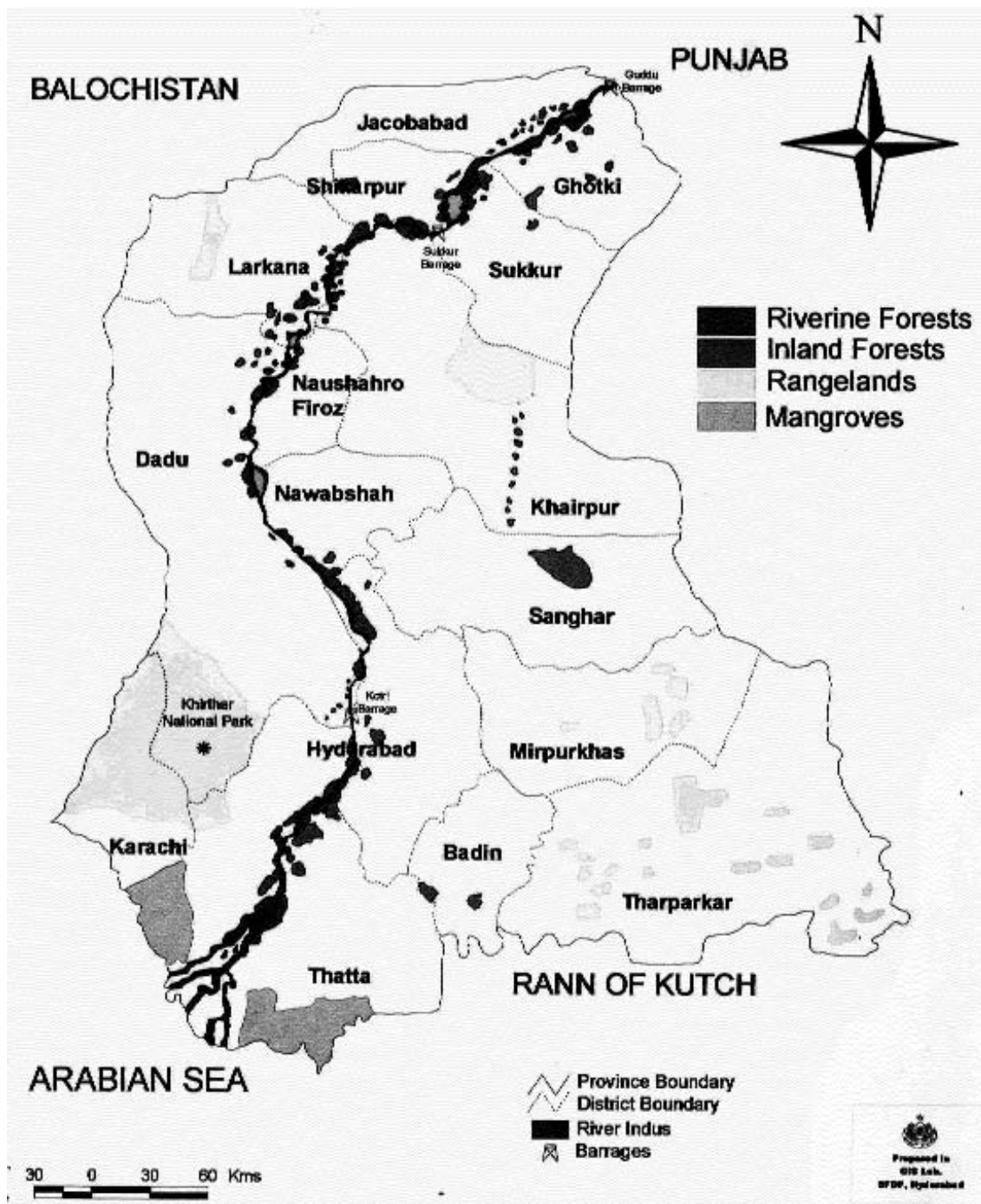


Map 8.1: Location of Arid Zones in Sindh

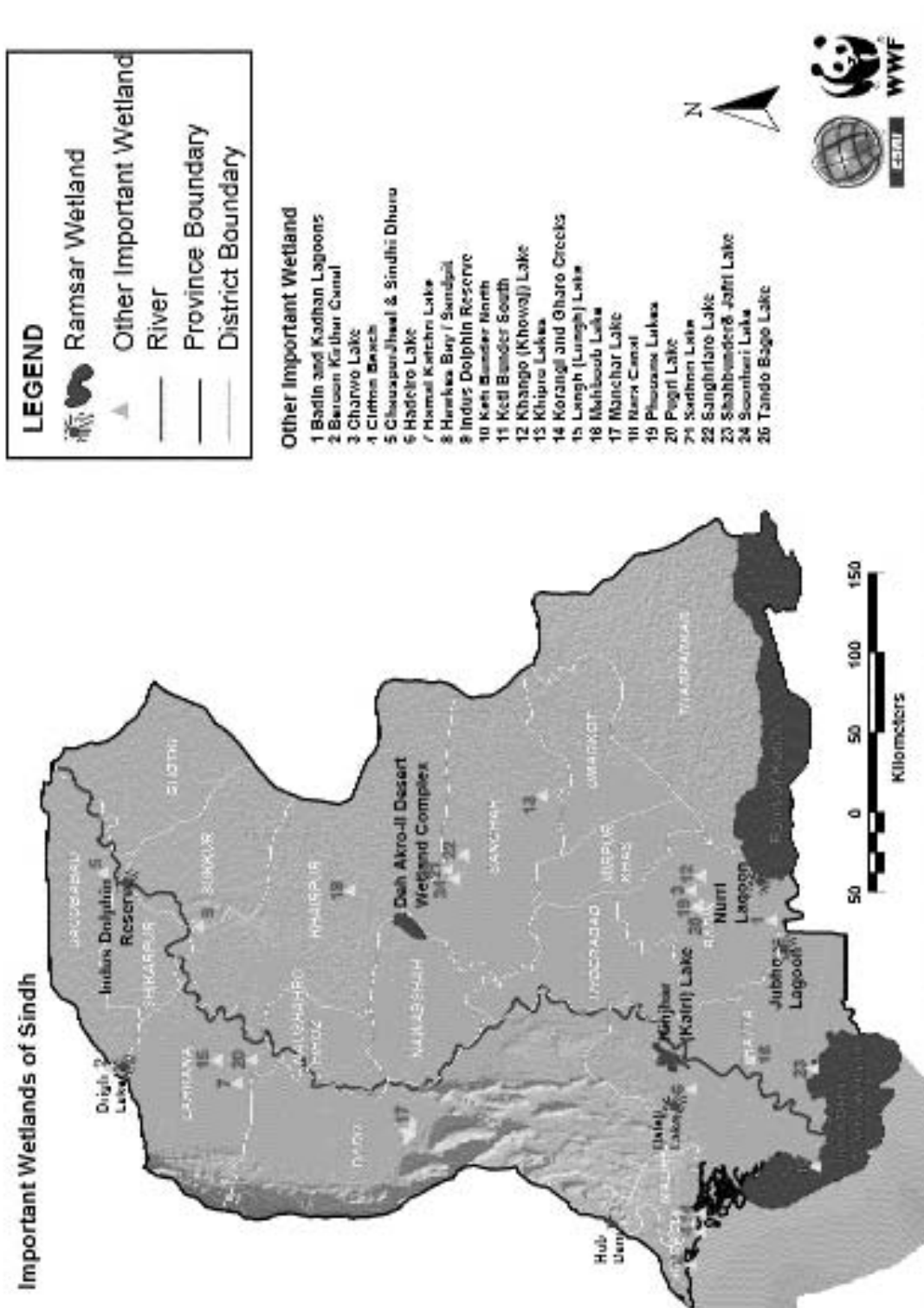


Source: Imdadullah Siddiqui

Map 9.1: Forest Types in Sindh

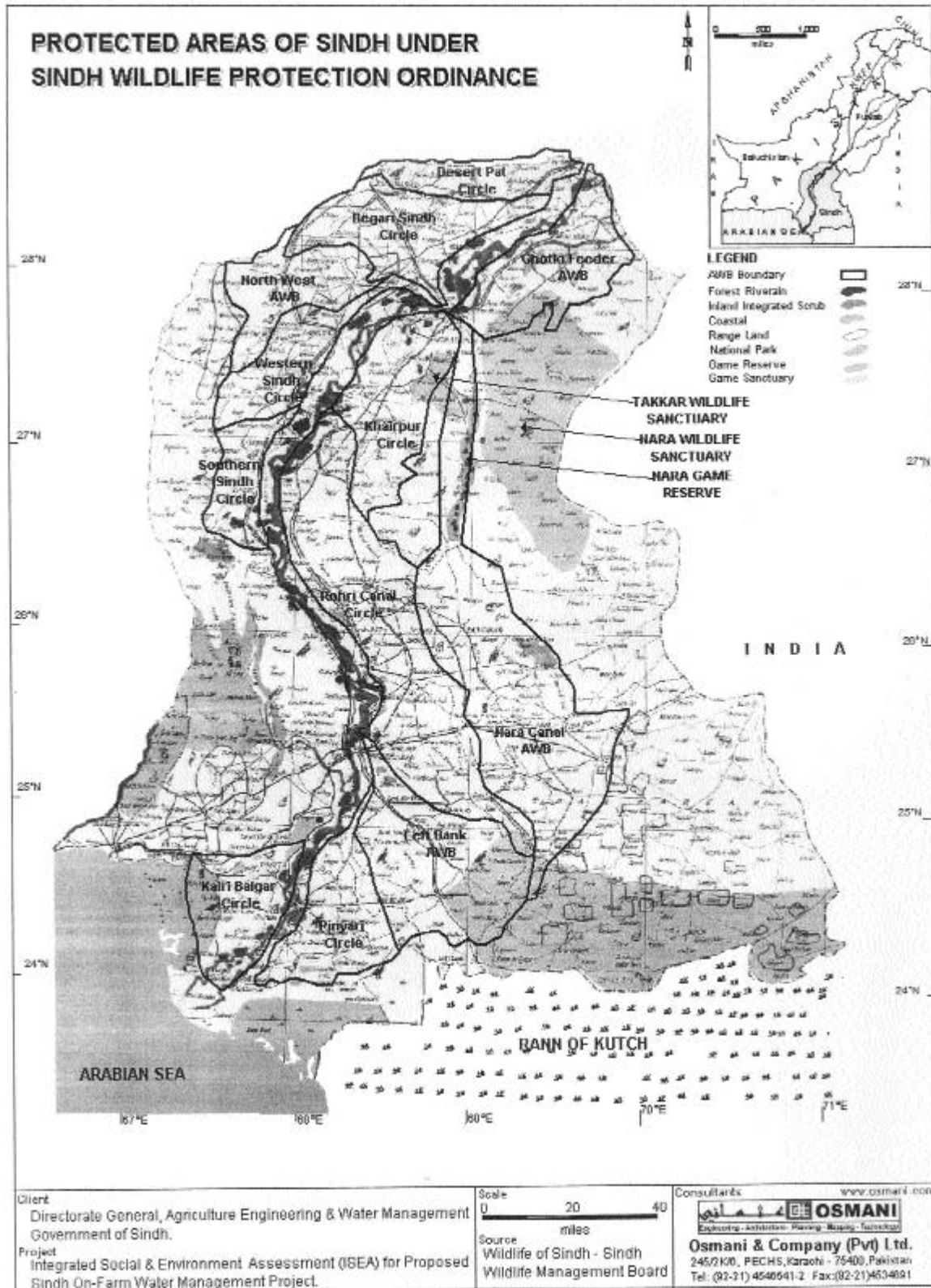


Map 10.1: Location of Sindh Wetlands



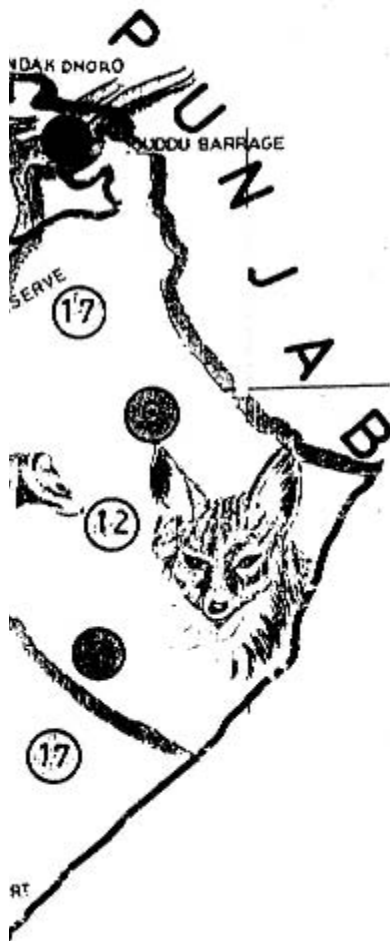
Source: WWF and ESRI

Map : Protected Areas of Sindh Under Sindh Wildlife Protection ordinance



Source: Wildlife of Sindh - Sindh Wildlife Management Board

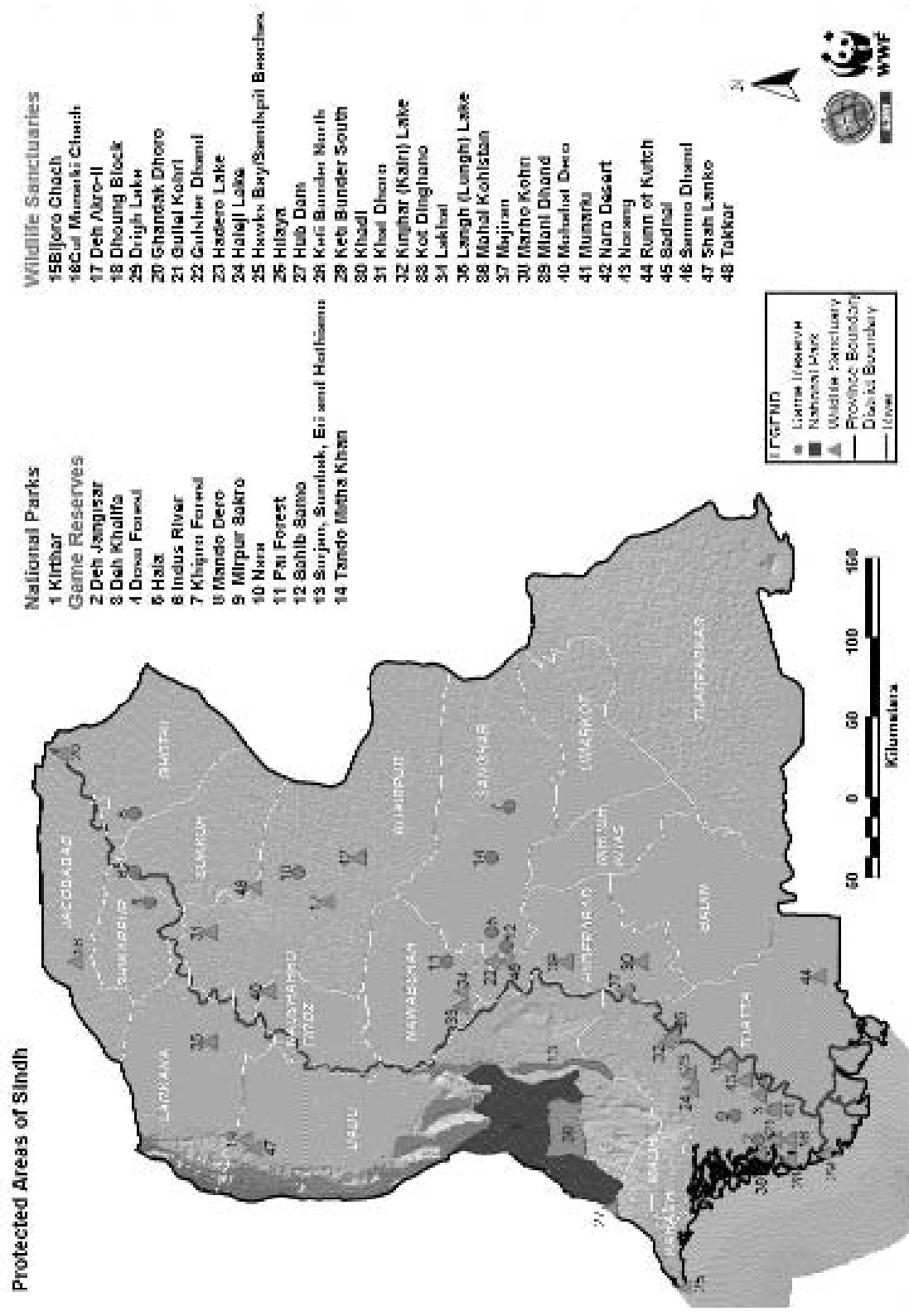
Map 13.2: Location of Wildlife Preservation Project



NAME OF ANIMALS

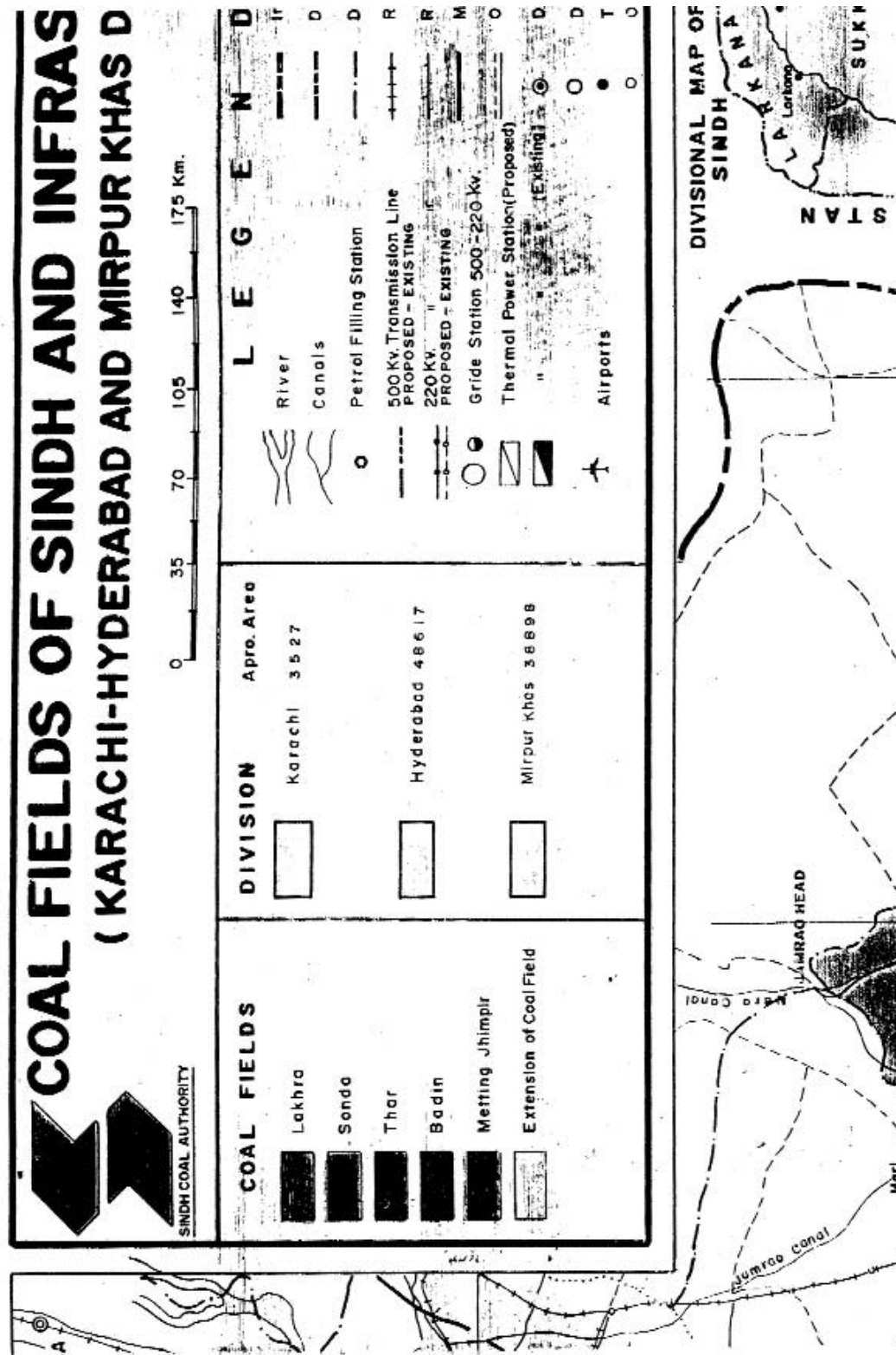
- INDIAN PANGOLIN
(Manis crassicaudata)
- LEOPARD OR PANTHER
(Panthera pardus)
- WOLF
(Canis lupus pallipes)
- JACKAL
(Canis aureus)
- STRIPED HYAENA
(Hyaena hyaena)
- INDIAN FOX
(Vulpes bengalensis)
- RED FOX
(Vulpes vulpes)
- 6 ● DESERT CAT
(Felis libyca)
- JUNGLE CAT
(Felis chaus)
- FISHING CAT
(Felis viverrina)
- 11 ● CARACAL
(Felis caracal)
- 12 ● SMALL INDIAN CIVET
(Viverricula indica)
- 13 ● SMOOTH INDIAN OTTER
(Lutra perspicillata)
- 14 ● HONEY BADGER
(Mellivora capensis)
- INDIAN WILD ASS
(Equus hemionus)
- HOG DEER
(Axis porcinus)
- 17 ● CHINKARA
(Gazella gazella bennetti)
- URIAL
(Ovis orientalis)
- 19 ● SIND WILD GOAT
(Capra hircus blythi)
- PLUMBEOUS DOLPHIN
(Sousa plumbea)
- INDUS DOLPHIN
(Platanista indi)
- CHUKOR
(Alectoris chukar chukar)
- INDIAN PEAFOWL
(Pavo cristatus)
- BLACK PARTRIDGE

Map 13.3: Protected Areas of Sindh

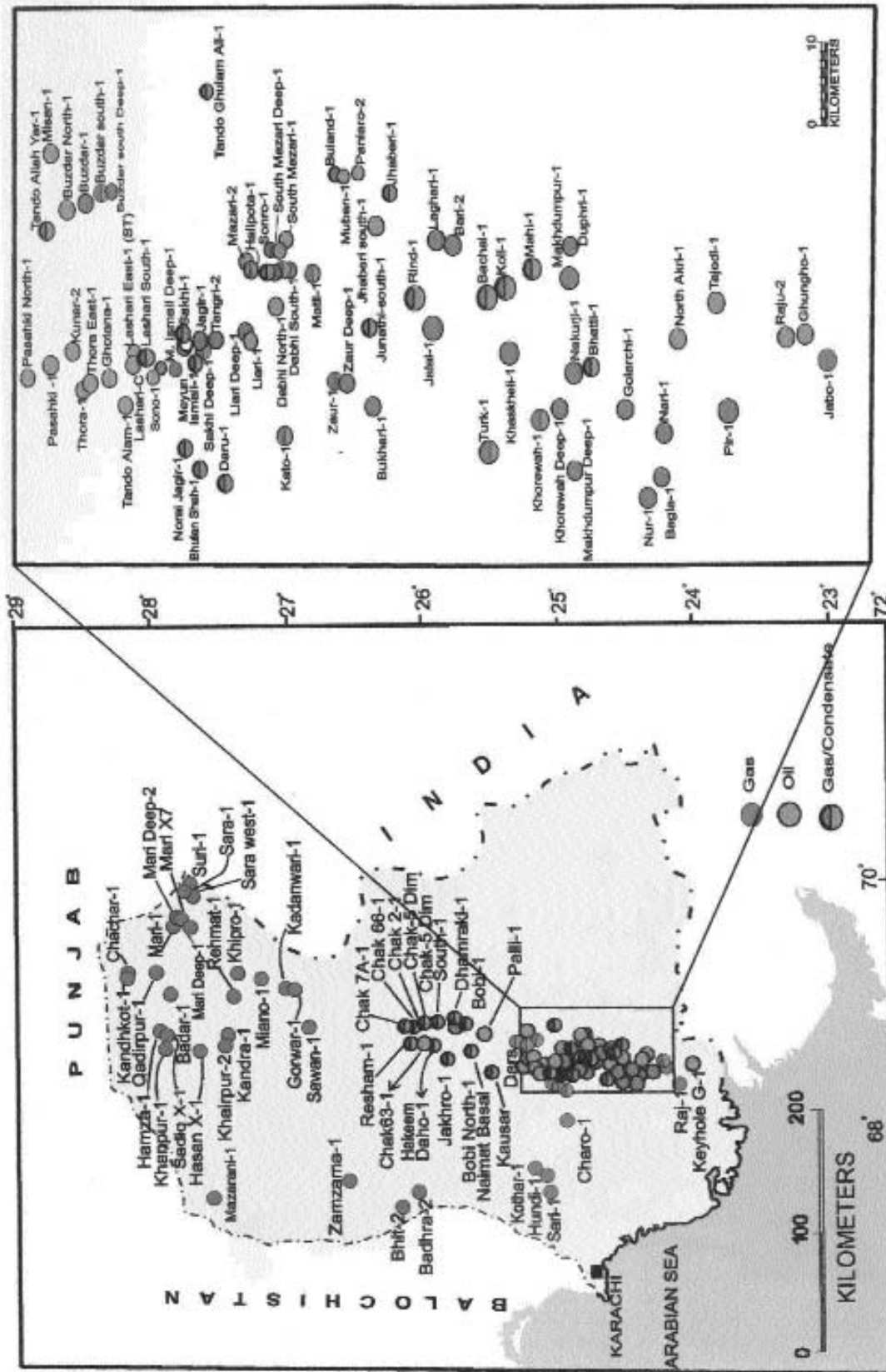


Source: WWF and ESRI

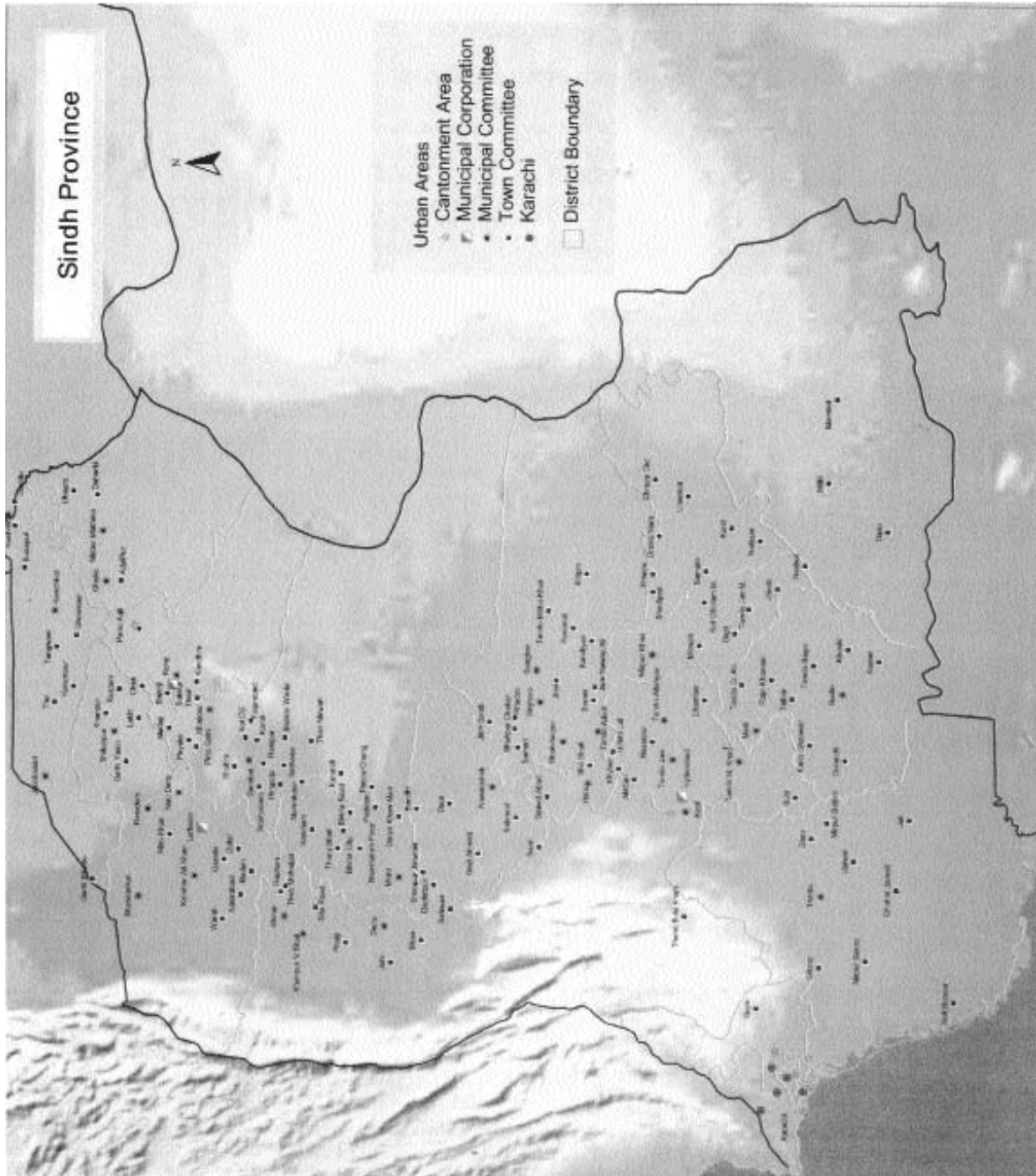
Map 14.1: Location of Coal Deposits in Sindh



Map 14.2: Location of Oil and Gas Fields in Sindh

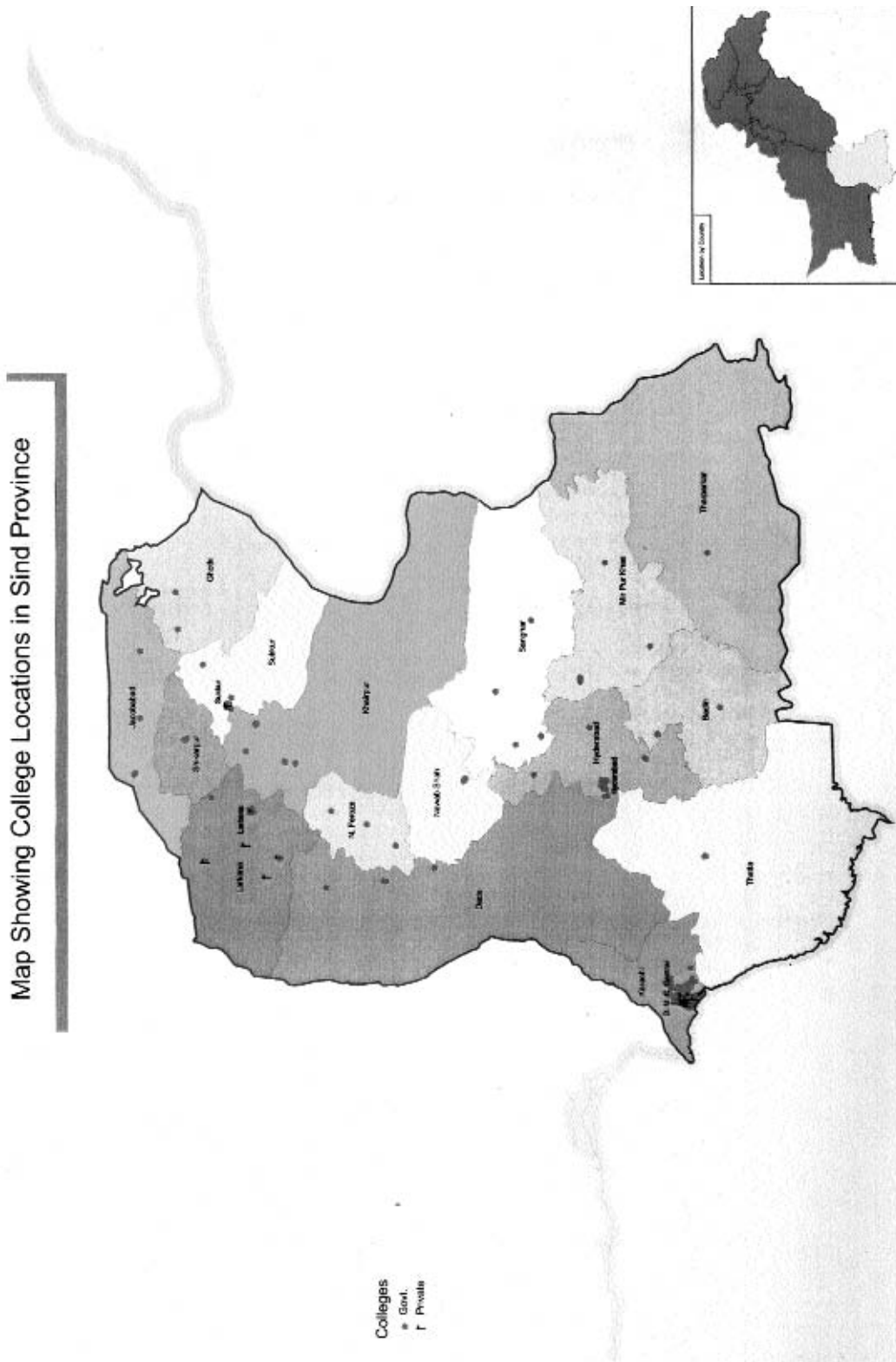


Map 15.1: Urban Settlements in Sindh



Source: Pakistan Education School Atlas Vo-II, Sindh Province

Map 21.1: Location of Colleges in Sindh



Source: Pakistan Education School Atlas Vo-II, Sindh Province

Map: Indus Delta Area based on SPOT XS

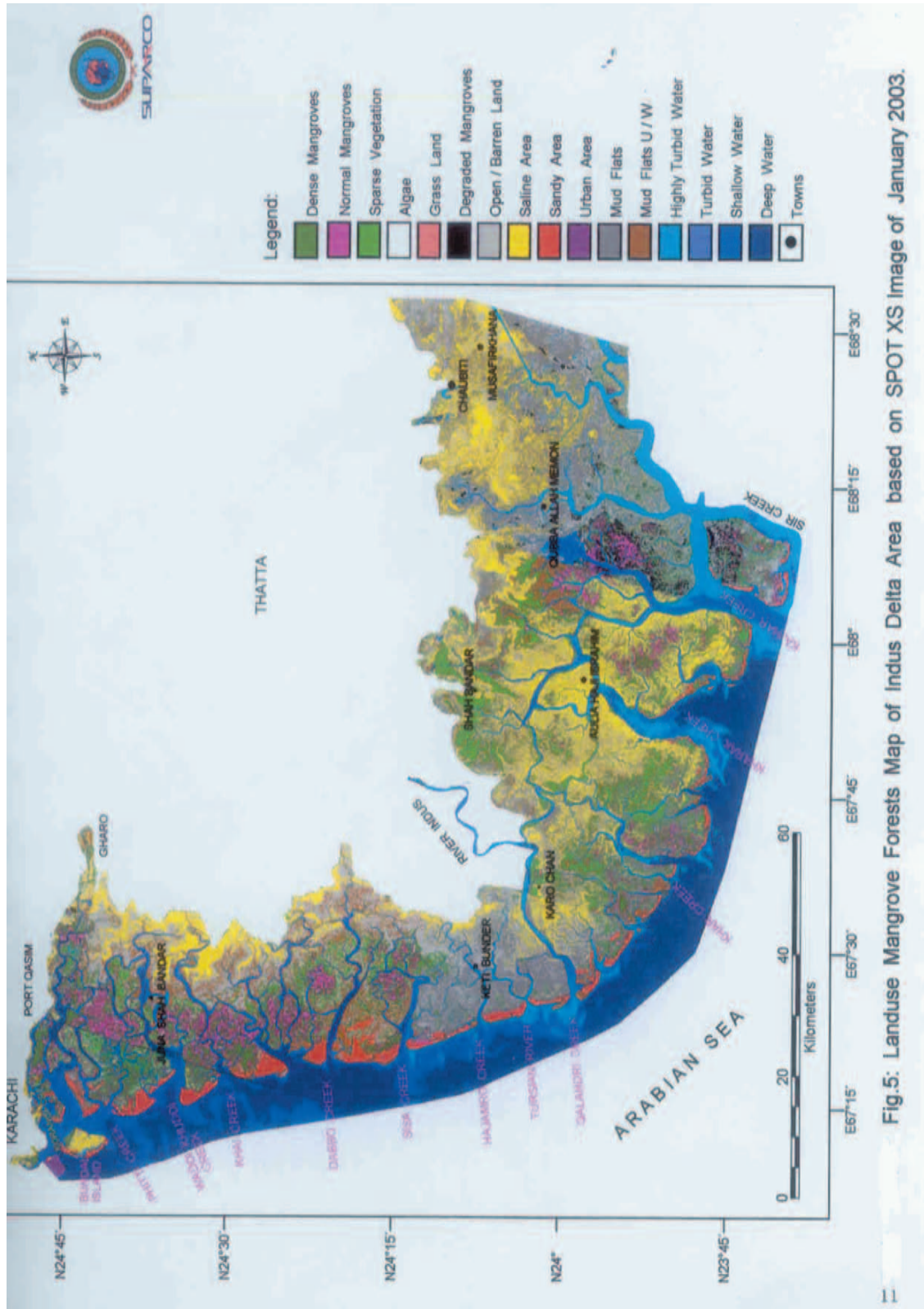


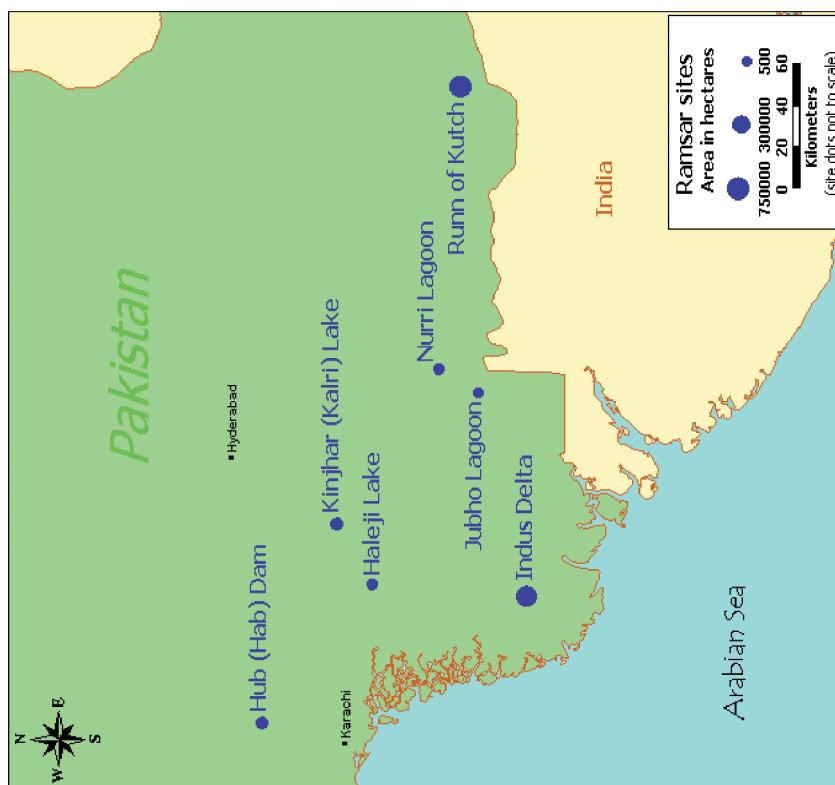
Fig.5: Landuse Mangrove Forests Map of Indus Delta Area based on SPOT XS Image of January 2003.

Map: Ramsar Wetlands Sites

Upper & Central Sindh



Lower Sindh



Source: http://www.wetlands.org/RDB/asia/pakistan_sites.html



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