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Guidebook for the Design and Implementation of Ecosystem-based Adaptation Measures in River Basins in Thailand

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Glossary

Ecosystem-based Adaptation (EbA)	การปรับตัวโดยอาศัยระบบนิเวศ
Nature-based Solutions (NbS)	การแก้ปัญหาที่อาศัยธรรมชาติเป็นพื้นฐาน
Climate Risk and Vulnerability Assessment (CRVA)	การประเมินความเปราะบางและความเสี่ยงต่อการเปลี่ยนแปลงสภาพภูมิอากาศ
Green Infrastructure	โครงสร้างพื้นฐานสีเขียว
Hybrid solutions	มาตรการโครงสร้างพื้นฐานแบบผสม
Ecosystem Services	การบริการของระบบนิเวศ
Adaptive Capacity	ความสามารถในการปรับตัว

Acronyms

CCMP	Climate Change Master Plan
CDP	Capacity Development Programme
CoP	Code of Practice
Eco-DRR	Ecosystem-based Disaster Risk Reduction
FLR	Forest Landscape Restoration
FPIC	Free, Prior and Informed Consent
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH
IPLC	Indigenous Peoples and Local Communities
IUCN	International Union for Conservation of Nature
NbS	Nature-based Solutions
NCCC	National Committee on Climate Change Policy
NWRM	Natural Water Retention Measures
TGCP	Thai-German Climate Programme
TMD	Thai Meteorological Department

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The final product also benefitted from feedback from various government officials at the Office of National Water Resources, Thailand. We are thankful for the inputs provided, which will ensure that the publication is as applicable as possible in their future work on Ecosystem-based Adaptation in the water sector.

Foreword

As the climate continues to change, Thailand is increasingly experiencing impacts from water-related threats. Incidences of drought in the dry season and flooding during the monsoon season are becoming more common, with nationwide impacts that disproportionately affect low-income communities who rely heavily on natural resources and agriculture for their livelihoods. As we are beginning to see the limitations of traditional, grey infrastructure approaches to water management, there is now increased understanding that the restoration, management and conservation of ecosystems can strengthen the resilience of the our country to climate-led water challenges, providing multiple benefits to both communities and biodiversity.

The *Guidebook for the Design and Implementation of Ecosystem-based Adaptation Measures in River Basins in Thailand* was developed as part of the Thai German Climate Programme, led by GIZ and funded by the International Climate Initiative. IUCN led the development of the Guidebook, with support from GIZ and UNEP World Conservation Monitoring Centre, among other partners. The publication is the result of multiple rounds of consultation with Thai government stakeholders and River Basin Organisations, held to ensure that it is as applicable and user-friendly as possible. It consolidates key guidance on how to effectively restore and conserve nature to support climate change adaptation in the water sector, providing human and biodiversity benefits.

The eight steps of the cycle, complemented by the associated forms, aim to guide practitioners through the process of designing, implementing, monitoring and evaluating, and mainstreaming Ecosystem-based Adaptation interventions for river basin management in Thailand. The Guidebook is directly supported by the EbA Code of Practice, developed by Thailand Environment Institute (TEI), which provides step-by-step details on the implementation of a range of EbA measures for water.

The Guidebook will be an essential resource as Thailand moves forward to strengthen climate change resilience in river basins. It will directly support the work of River Basin Organisations as they develop River Basin Plans across the country. This publication will also be an essential tool for engineers as they design and implement measures to reduce climate change vulnerability.

The Office of National Water Resources (ONWR) will support the integration of the Guidebook into policy at the national level in Thailand. Thailand's 20-Year Water Management Master Plan (2018-2037) will be amended to include reference to both the Guidebook and the EbA Code of Practice, promoting the mainstreaming of EbA in our work. This work will pave the way for more sustainable development at the national level, simultaneously decreasing risks and enhancing biodiversity throughout the country.

About this guidebook

The Guidebook for the Design and Implementation of Ecosystem-Based Adaptation in River Basins in Thailand was developed by IUCN, with inputs from GIZ, the Thai government and numerous other partners under the Thai-German Climate Programme-Water, funded by the International Climate Initiative of the German Federal Ministry for Economic Affairs and Climate Action. The guidebook aims to serve as a framework for understanding, developing, implementing and mainstreaming Ecosystem-based Adaptation (EbA) measures in river basins throughout Thailand.

The Guidebook comes as Ecosystem-based Adaptation, under the umbrella of Nature-based Solutions more broadly, are gaining momentum in Thailand. Nature-based Solutions are defined by IUCN as "actions to protect, sustainably manage, and restore natural and modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits" (IUCN 2016). Ecosystem-based Adaptation (EbA) is a subset of NbS that focuses on the use of biodiversity and ecosystem services as part of an overall adaptation strategy to help people to adapt to the adverse effects of climate change (CBD, 2009 & 2010). Recent developments have seen increasing mention of EbA, at global conventions on climate change and representation of EbA in both Nationally Determined Contributions and National Adaptation Plans. Both national and local governments are beginning to understand the value of EbA as an important means of simultaneously restoring ecological integrity while also provide climate change adaptation benefits. This momentum is further amplified by the current and future impacts of climate change on water resources. The majority of studies on changes in precipitation in Thailand have shown a trend towards wetter wet seasons and drier dry seasons, potentially leading to increases in flooding (and associated flash floods and landslides) and drought throughout the country, highlighting the need to scale-up adaptation measures - including EbA - to address these challenges.

Overall, the process of implementing EbA in river basins in Thailand can generate the following outcomes:

- Limiting and managing the extent of floods and droughts, and their impacts, at the local, provincial and national levels;
- Limiting erosion and siltation processes, worsened by climate-induced floods;
- Supporting the maintenance of key water-related livelihoods in the basin such as fisheries and agriculture;
- Supporting the maintenance and resilience of freshwater and non-freshwater biodiversity;
- Garnering high-level political support for EbA;
- Reducing reliance on grey infrastructure, thus reducing initial and maintenance costs for governments, as well as externalised environmental costs;
- Developing a shared understanding of opportunities to implement EbA and the promotion of the multiple benefits provided by EbA.

The guidebook was developed for the following target user groups:

- River Basin Committees in each of Thailand's 22 river basins;
- Relevant government agencies directly responsible for water management or adjacent natural resources and infrastructure management;
- Relevant government agencies responsible for climate change adaptation;
- Individuals who are contributing to the development of EbA measures in Thailand, e.g. experts and stakeholders at the national or regional level, who need to understand the process of designing and implementing EbA for water.

Part 1 of the Guidebook provides a background of the development of the concept of Nature-Based Solutions and how it links to Ecosystem-based Adaptation. It guides the reader through several key criteria to consider when developing NbS/EbA approaches at local scale, introducing key EbA approaches in river basins.

Part 2 of the Guidebook provides a step-wise flexible framework for identifying effective EbA measures to address climate impacts in each of the 22 river basins in Thailand. The eight steps intend to guide stakeholders in: 1) conducting a stocktaking of the available information in the focal area; 2) carrying out a climate risk vulnerability assessment to understand the current and future climate threats and vulnerable areas; 3) mapping the key ecosystems and ecosystem services to understand which ecosystem-based measures can address the climate threats; 4) developing an EbA vision for the focal area, highlighting the community aspirations; 5) developing a Theory of Change to identify and validate EbA measures; 6) developing indicators and monitoring and evaluating the EbA measures; 7) implementing the measures and finally, 8) using the results to further influence relevant policies at both the local and national levels.

IMPORTANT - The EbA Guidebook is not intended as a standalone document. Considering the complexity and nuances of implementing EbA for water, the variety of societal challenges that can be tackled, and the range of potential EbA measures that could be implemented, the Guidebook aims to provide overall guidance, and will need to be complemented by external support, capacity building, site visits and the integration of best practices. The Guidebook aims to support individuals who are not EbA specialists in understanding opportunities for EbA in the Thai water sector. While the Guidebook provides links to more specific resources, the steps will focus on a more general approach, that can be refined as implementation teams move through the process.

The Guidebook is complemented by the Climate Risk and Vulnerability Assessment (CRVA) Tool and Guidance in Step 2, providing a step-wise approach for conducting climate risk vulnerability assessments and in Step 5, the design of EbA measures is informed by the EbA Code of Practice (COP) for Thailand.

This first edition of the Guidebook will be further refined as stakeholders utilise it during subsequent collaboration projects implemented by GIZ and IUCN in Thailand. The project team welcomes any feedback from any users of the Guidebook as they work through the process outlined in the following sections.

Part 1

Nature-based Solutions and Ecosystem-based Adaptation – background, definition, approaches and Thai context

For most of the 20th century, decision-makers treated the conservation of nature as peripheral to national and global agendas. At best, it was considered a worthy interest, at worst, an obstacle to development. However, growing scientific consensus indicates that such views were misplaced and that "nature is essential for human existence and good quality of life" (IPBES 2019). Failure to recognise this fact not only results in a model of economic growth that significantly contributes to the loss of biodiversity, it also misses the opportunity to effectively deploy nature in helping resolve major societal challenges such as climate change, food security and disaster risk reduction.

There is increasing recognition that a healthy natural environment is key for supporting human quality of life through the provision of ecosystem services. Thus, development partners and conservation organisations have shifted away from traditional development approaches, and begun to integrate the conservation, management and restoration of ecosystems into their work to address societal challenges.

This approach is now widely referred to as Nature-based Solutions and has been shown to have multiple benefits for both society and biodiversity at the local and global scales.

1.1 Ecosystem Services

Ecosystem services form the basis of any Nature-Based Solution. The Millennium Ecosystem Assessment defines ecosystem services as the benefits people obtain from ecosystems (MEA 2005). From 2001 to 2005, the Millennium Ecosystem Assessment analysed the work of more than 1,360 experts worldwide, to assess the consequences of ecosystem change for human well-being. Its findings provided a state-of-the-art scientific appraisal of the condition and trends in the world's ecosystems and the services they provide, as well as the scientific basis for action to conserve and use them sustainably.

Ecosystem services are divided into four categories:

1. Provisioning services, including the products obtained from ecosystems, such as food (including fisheries) and water, fibre and fuel;

2. Regulating services, including the services that ecosystems provide by acting as regulators such as water regulation, water purification and disease control;

3. Cultural services, including the non-material benefits people obtain from contact with ecosystems. They include aesthetic, spiritual and psychological benefits;

4. Supporting services, the ecosystem services that are necessary for the production of all other ecosystem services such as nutrient cycling and soil formation, which maintain the conditions for life on Earth.

Figure 1 *The four categories of ecosystem services with examples of services within the categories (RRC-EA 2020)*

In most cases, one ecosystem provides a range of services, across several of the four categories. The importance of the services depends on several factors including the size of the ecosystem, but also its state of conservation, and who is using the services. Degradation of ecosystems will lead to a decrease in the services they are able to provide.

1.2 Nature-based Solutions – the definition

To help promote the uptake of Nature-based Solutions (NbS), IUCN members formally adopted a definition during the 2016 World Conservation Congress. NbS are defined as:

"actions to protect, sustainably manage, and restore natural and modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits"
(IUCN 2016)

This definition emphasizes on the fact that the core strategy of NbS should include the conservation of healthy ecosystems and/or the restoration of degraded ecosystems. It is also important to note that the expected benefits of NbS are two-fold, tackling a societal challenge and providing human benefits, but also, and at the same time, providing direct biodiversity benefits.

NbS acts as an umbrella term for a wide range of more specific approaches that all use approaches of restoring, protecting and managing ecosystems to address societal challenges (Figure 2) This guidebook will focus on Ecosystem-based Adaptation (EbA), a type of NbS designed to tackle climate change induced threats (see Section 3).

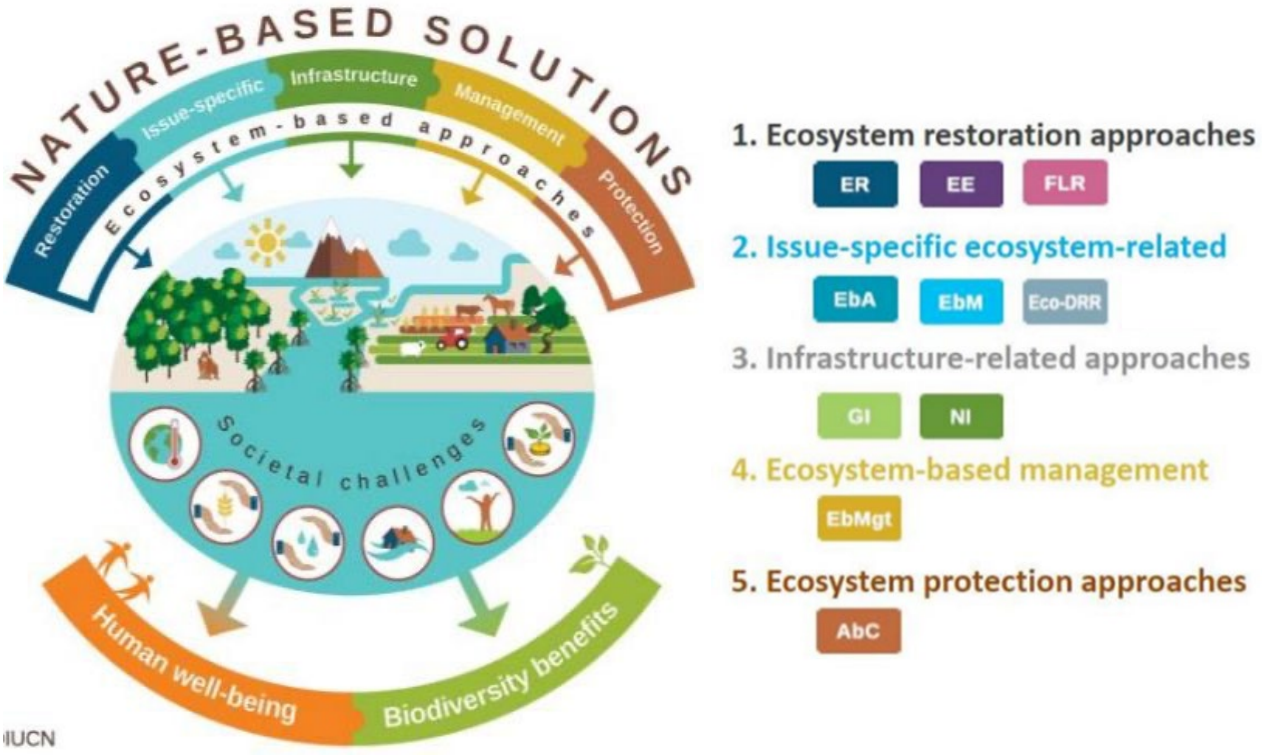


Figure 2 *Nature-based Solutions is an umbrella term for a variety of ecosystem based approaches*

Acronym list for Figure 2

Ecosystem restoration approaches	
ER	Ecosystem Restoration
EE	Ecosystem Engineering
FLR	Forest Landscape Restoration
Issue-specific ecosystem-related	
EbA	Ecosystem-based Adaptation
EbM	Ecosystem-based Management
Eco-DRR	Ecosystems-based Disaster Risk Reduction : Eco-DRR
Infrastructure-related approaches	
GI	Green Infrastructure
NI	Natural Infrastructure
Ecosystem-based Management	
EbMgt	Ecosystem-based Mitigation
Ecosystem protection approaches	
AbC	Area-based Conservation

1.2.1 Nature based Solutions – key criteria

As NbS enters into policy and is adopted by projects on the ground, it is important to ensure greater clarity and precision of what the concept entails and what is required for it to be successfully deployed. Without this, the application of NbS could result in inconsistent, ungrounded, poor quality or unsustainable applications.

To address this, IUCN launched the Global Standard for Nature-based Solutions (IUCN 2020) in July 2020. The Standard consists of eight criteria and their associated indicators, which address the pillars of sustainable development (biodiversity, economy and society) and resilient project management.

The eight criterion from the IUCN Global Standard for Nature-based Solutions largely overlap and go beyond the previously developed five EbA criteria derived from the 2017 FEBA technical paper, *Making Ecosystem-based Adaptation Effective – A Framework for Defining Qualification Criteria and Quality Standards* produced by GIZ, IUCN, and the International Institute for Environment and Development. Therefore, the NbS Criteria were selected as a more comprehensive set of criteria to evaluate potential measures. The eight criteria from the IUCN Global Standard are summarized in Box 1, and cross-reference the related EbA criteria, where relevant, to demonstrate the similarities between the two sets of criteria.

Box 1 Key criteria for the design and implementation of NbS measures – from the IUCN Global Standard and demonstrated links to the EbA Criteria (FEBA 2017)

Criterion 1 - NbS effectively address societal challenges

It is important to ensure that the NbS is designed in response to a societal challenge(s) that has been identified as a priority by those who are or will be directly affected by the challenge(s). All stakeholders, especially rights holders and beneficiaries of the NbS need to be involved in the decision-making process for identifying the priority challenge(s). [EbA Criteria 1 - Reduces social and environmental vulnerabilities] [EbA Criteria 2-Generates societal benefits in the context of climate change adaptation]

Criterion 2 - Design of NbS is informed by scale

This criterion aims to encourage the recognition of the complexity and uncertainty that occur in land/seascapes. The scale applies not only to the biophysical or geographic perspective but also to the influence of economic systems, policy frameworks and the importance of cultural perspectives. Therefore, a "systems framing" of the NbS can help better acknowledge these interactions and risks. [EbA Criteria 3- Restores, maintains or improves ecosystem health]

Box 1 Key criteria for the design and implementation of NbS measures – from the IUCN Global Standard and demonstrated links to the EbA Criteria (FEBA 2017)

Criterion 3 - NbS result in net gain to biodiversity and ecosystem integrity

NbS are derived as goods and services from ecosystems, and therefore strongly depend on the health of an ecosystem. Biodiversity loss and ecosystem change can have significant impacts on the functioning and integrity of the system. Therefore, NbS design and implementation must avoid undermining the integrity of the system and instead, proactively seek to enhance the functionality and connectivity of the ecosystem. Doing so can also ensure the long-term resilience and durability of the NbS. [EbA Criteria 1- Reduces social and environmental vulnerabilities] [EbA Criteria 3- Restores, maintains or improves ecosystem health]

Criterion 4 - NbS are economically viable

The return on investment, effectiveness of the intervention, equitable distribution of benefits and costs are key determinants of success for an NbS in the long run. Therefore, this criterion requires that sufficient consideration is given to the economic viability of the intervention, both at the design stage and its implementation. If the economic feasibility is not adequately addressed, NbS run the risk of being short-term projects, where, after closing, the solution and benefits provided cease to exist. [EbA Criteria 2-Generates societal benefits in the context of climate change adaptation]

Criterion 5 - NbS are based on inclusive, transparent and empowering governance processes

This criterion requires that NbS acknowledge, involve and respond to the concerns of a variety of stakeholders, especially rights holders. NbS must also adhere to and align with the prevailing legal and regulatory provisions, being clear on where legal responsibilities and liabilities lie. This is important to reduce intervention's sustainability risks, but also to enhance its social 'license to operate'. [EbA Criteria 5- Supports equitable governances and enhances capacities]

Criterion 6 - NbS equitably balances trade-offs between achievement of their primary goal(s) and the continued provision of multiple benefits

Ecosystems provide a wealth of different benefits and not everyone values each of them in the same way. Therefore, trade-offs between stakeholders and sectors is inevitable and needs to be managed effectively and equitably. This criterion requires that NbS proponents acknowledge these trade-offs and follow a fair, transparent and inclusive process to balance and manage them over time and space.

Box 1 Key criteria for the design and implementation of NbS measures – from the IUCN Global Standard and demonstrated links to the EbA Criteria (FEBA 2017)

Criterion 7 - NbS are managed adaptively, based on evidence

Ecosystems have complex, dynamic and self-organising nature. This also means that ecosystems have greater resilience, which confers a wider range of options to respond to unanticipated social, economic or climate events. This criterion therefore, aims to exploit this attribute of ecosystems through designing of adaptive management strategy for the proposed NbS.

Criterion 8 - NbS are sustainable and mainstreamed within an appropriate jurisdictional context

This Criterion requires that NbS are designed and managed with a view to long-term sustainability and are aligned with sectoral, national and other policy frameworks. There are various approaches to mainstreaming NbS; however, all rely on strategic communications and outreach with audience from different sectors, including individuals, institutions (e.g. national government) and global networks (e.g. Sustainable Development Goals, Paris Agreement). [EbA Criteria 4- Is supported by policies at multiple levels]

Box 2 EbA Safeguards

As EbA measures are increasingly included in policies and strategies, and increasingly implemented on the ground, robust safeguards and standards must be in place to ensure their effectiveness, sustainability, and best practices. In the simplest definition, safeguards are principles or measures that aim to protect someone or something from harm or damage. In the context of EbA, safeguards aim to prevent negative impacts and promote positive impacts, considering environmental, socio-economic and governance aspects.

Safeguards for EbA should cover the following issues and topics [1]:

o Comprehensive and appropriate assessment of potential environmental, social and other impacts, and identification of steps to reduce negative impacts and promote positive impacts

[1] Global Youth Biodiversity Network (no date). What are nature-based solutions? Risks, concerns and opportunities. https://networknature.eu/product/22441; Seddon, N., Chausson, A., Berry, P., Girardin, C.J.A., Smith, A. and Turner, B. (2020). Understanding the value and limits of nature-based solutions to climate change and other global challenges. Biological Sciences 375 (1774). https://royalsocietypublishing.org/doi/10.1098/rstb.2019.0120; CBD Decision 14/5 (2018) Biodiversity and climate change. https://www.cbd.int/doc/decisions/cop-14/cop-14-dec-05-en.pdf; UNFCCC Decision 1/CP.16. UNFCCC (2018). The Cancun Agreements. https://unfccc.int/resource/docs/2010/cop16/eng/07a01.pdf

Box 2 EbA Safeguards

o Conservation/enhancement of biodiversity and ecosystems with a focus on protecting ecological integrity and native species, and preventing the introduction of invasive alien species.

o Recognition of rights of Indigenous Peoples and Local Communities, including respect for rights to self-determination, to land and natural resources, and the equitable distribution of benefits (e.g. using procedures like Free, Prior and Informed Consent)

o Stakeholder participation and gender responsiveness in design and implementation, with consideration of the different needs and roles of groups of people, including people of all genders, as well as youth, the elderly, minority groups, etc.

o Respect for traditional and local knowledge and practices

o Transparent sharing of information about the planning, design, implementation, and monitoring of EbA, and appropriate monitoring of social and environmental safeguards, risks and befits of EbA measures

o Access to feedback and redress mechanisms, i.e. to ensure complaints and feedback about the EbA measures can be received and addressed

Although there are no safeguards frameworks specifically developed for EbA, there are many safeguards frameworks, procedures and resources that can be used to make sure EbA measures are reducing risks and delivering benefits. Some examples are:

- the IUCN Global Standard for NbS, which sets out criteria for effective NbS, including EbA [2]

- the FEBA Framework for Defining Qualification Criteria and Quality Standards [3]

- the CBD Voluntary guidelines for the design and effective implementation of ecosystem-based approaches to climate change adaptation and disaster risk reduction [4]

- Major safeguards policies of financial institutions / development partners, including those of the Green Climate Fund [5], the World Bank [6] and UN agencies.

In addition, as EbA are implemented in specific, local contexts, they should also follow any national safeguards, regulations and requirements. For example, these can include national regulations on environmental impact assessment, forest management standards, water resources management guidelines, employment practices, and so on.

[2] https://www.iucn.org/theme/nature-based-solutions/resources/iucn-global-standard-nbs

[3] FEBA (Friends of Ecosystem-based Adaptation) (2017). Making Ecosystem-based Adaptation Effective – A Framework for Defining Qualification Criteria and Quality Standards. https://pubs.iied.org/g04167

[4] CBD Decision 14/5 (2018). Biodiversity and climate change. https://www.cbd.int/doc/decisions/cop-14/cop-14-dec-05-en.pdf

[5] https://www.greenclimate.fund/projects/safeguards/ess

[6] https://www.worldbank.org/en/projects-operations/environmental-and-social-policies

1.3 Ecosystem-based Adaptation – a type of NbS

This guidebook will focus specifically on Ecosystem-based Adaptation, also referred to as Nature-based Solutions for climate change adaptation. EbA uses biodiversity and ecosystem services to support communities in adapting to the impacts of climate change through the conservation, management and restoration of ecosystems, as part of a wider strategy.

As water-related extreme weather events such as droughts and floods increase in frequency and intensity, they are leading to significant damage to infrastructure and mortality, making EbA an increasingly relevant approach to support increased climate change resilience (IPCC 2012). Globally, water-related disasters accounted for an estimated 90 percent of the most disastrous events since 1990, causing US $1.3 trillion in damage and affecting 4.2 billion people (United Nations 2015). EbA approaches can also be used to minimise the impacts of slower onset impacts of climate change, such as changes in sea-level rise, seasonal temperatures and rainfall patterns.

Traditional attempts to mitigate the impacts of water-related disasters have focused mainly on 'hard' or engineered approaches, however these grey infrastructure approaches often focus on a single hazard, and can potentially increase the system's vulnerability in the long term (Secretariat of the Convention on Biological Diversity 2019). The inflexible characteristics of engineered structures can also lead to their decreased efficiency over time under unpredictable climate conditions (Royal Society 2014). Alternatively, the dynamic nature of ecosystem-based, or hybrid green-grey approaches (where NbS are combined with more traditional infrastructure), allows them to more effectively support climate change adaptation over time, and there is higher potential for the provision of multiple benefits. In some cases, hybrid measures may be more appropriate than EbA measures, for example, when there is a need to rapidly respond to severe climate-related impacts that threaten communities and ecosystems. Hybrid measures may also be more cost-effective than EbA measures, giving them a distinct advantage when considering how to best address climate impacts. There is a need to consider all potential options in the decision-making process and weigh their long-term costs and benefits.

Ecosystem services can help tackling climate change impacts by addressing some of the threats directly through regulating services. For example, wetlands can limit the impact of floods by storing water, and mangroves can limit coastal erosion and saline intrusion. Provisioning services also support climate adaptation by supporting the maintenance of livelihoods for communities through, for example, the continuous provision of fisheries or the support of water for agriculture in case of drought.

1.3.1 EbA in a river basin – the overall approach

When considering the application of EbA in river basins, there is a wide range of opportunities to conserve, manage and restore ecosystems from the headwaters of the river, to the river's mouth, that can strengthen the resilience of communities to water-related climate threats.

Figure 3 presents a vast array of EbA approaches which can be implemented in the context of addressing water-related climate change impacts. They can be implemented as individual approaches, but should ideally form part of a basin-wide strategy on integrated water and climate change or disaster risk management, with a set of policy, financial and technical approaches that are complementary and mutually reinforcing. These examples highlight interventions in freshwater ecosystems and in water-related ecosystems such as forests and agricultural landscapes. Step 5 of this guidebook will provide more technical guidance on approaches and measures that can be selected depending on the context and nature of the climate threats being targeted. EbA approaches should ideally be part of a basin or landscape adaptation strategy, compatible in specific cases with grey infrastructure (Box 4).

Typical water-related EbA approaches, illustrated in Figure 3 include the following:

Maintenance or restoration of forest cover in head water areas **-** Forests in headwater areas have a beneficial role for water quantity and quality, along with a range of other services. Forest soils generally have better infiltration capacity than other land cover types and may act as a "sponge," slowly releasing accumulated rainfall. In areas of high relief, reforestation/afforestation of headwater catchments can support slope stabilization and may reduce the risks associated with landslides. The reforestation or afforestation of headwaters in dry areas may also lead to changes in water availability. Technical approaches include replanting and supporting natural regeneration when possible.

Re-meandering in the mainstream **-** In some areas in Thailand, economic development within the basin may have led to a straightening of the river, cutting off river meanders to facilitate navigation or increase the rate of drainage to reduce flooding. This increases the speed and strength of the river flow, increasing erosion, and impacting freshwater biodiversity. Depending on the case, re-meandering the mainstream and connecting it to former oxbows can slow water velocity, recreate habitat, both aquatic and terrestrial, reduce erosion, increase soil water retention and help to reduce runoff. This approach must be carefully evaluated with local communities to ensure that it has the intended effect on water supplies and does not impact water availability and storage in the dry season.

Removal of dams, weirs and other barriers to restore an environmental flow - Dams and other longitudinal barriers physically separate one part of a river from another, preventing both sediment and fauna from moving between sections of river. Removing these man-made physical barriers, particularly those that are no longer in use, and restoring the slope of the river, allows the river to return to more natural state and promotes river continuity, improving aquatic habitat and supporting fisheries. Restoring environmental flow also increases the flow of sediments into floodplains and deltas, supporting the replenishment of nutrients in soils and thus providing more fertile land for agriculture. The removal of longitudinal barriers such as floodwalls, levees or concrete weirs in a river or a better operation of these barriers so that they maintain an environmental flow and allow the migration of aquatic fauna across its boundaries is an important component of an EbA strategy at basin level, as it supports the functioning of freshwater ecosystems.

Floodplain and wetlands restoration and management - In many basins in Thailand, floodplains have been cut off from the river by urbanisation and associated grey infrastructure, such as dikes, with the intention to reduce damage to infrastructure and agriculture from flooding. Reconnecting the floodplain and wetlands to the river provides a natural space for the retention of floodwaters, creating aquatic habitat for fisheries and feeding grounds for waterbirds. In addition, increased sediment deposition promotes soil fertility. Wetlands also provide a role in buffering floods and droughts, and reduce erosion in coastal areas, allowing them to support climate change adaptation. The carbon storage capacities of wetlands can also provide climate change mitigation. Many wetlands in Thailand also have aesthetic and cultural values for local communities and Indigenous groups. The restoration of floodplains and wetlands relies on a number of complementary measures, including: reopening of silted wetlands, reconnection of wetlands to the mainstream, creation of lakes or ponds within the floodplain, modification of agricultural practices and livelihoods, invasive species removal, plantation of native grasses, shrubs and trees, and riparian buffer installation and development. Riparian buffers can also provide the additional benefit of reducing sediment loads from tributaries into oxbow lakes, minimising siltation and complementing EbA measures related to re-meandering the river.

Restoration of coastal wetlands and mangroves - Coastal wetlands including mangroves, seagrass beds, coral reefs and mudflats, provide essential habitat to juvenile fish and other coastal and marine organisms. These habitats also help in mitigating the impacts of storms, reducing saline intrusion, and are key habitats for blue carbon storage, or the sequestration of carbon in the world's oceanic and coastal ecosystems. Restoring seagrass beds, coral reefs, mudflats and mangroves can include planting new seagrass, propagating coral fragments or mangroves, or protecting these habitats to allow for natural regeneration. The removal of embankments and other hard infrastructure can also foster the restoration of mudflats and other coastal wetlands.

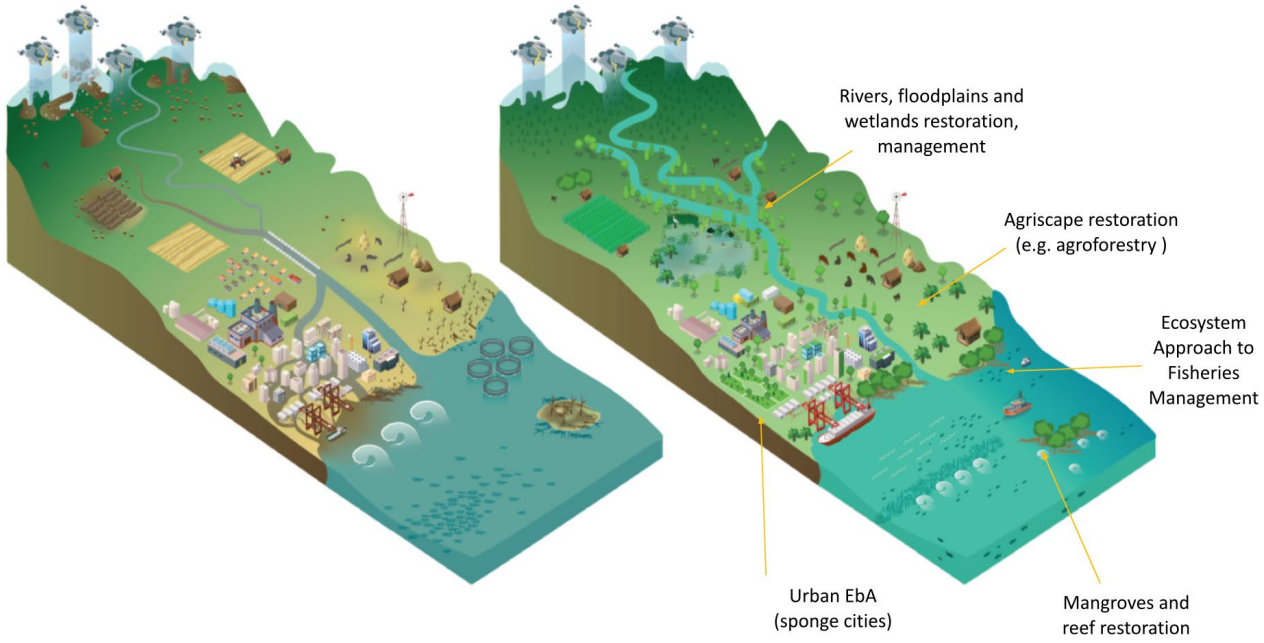


Figure 3 *Transitioning from a business as usual approach (left) to an EbA approach (right) in river basins (GIZ 2018)*

Box 3 Is it Ecosystem-based Adaptation or Community-based Adaptation?

There is often a confusion between Ecosystem -based Adaptation and Community-based Adaptation (CbA). The main difference is that the focus of adaptation measures in CbA is that they are community-led while the adaptation measures do not necessarily include the restoration, conservation or management of ecosystems. The direct inclusion of community stakeholders from the beginning of the EbA development process, is however, essential for inclusive, transparent and empowering governance, as highlighted in Criterion 5 of the NbS Global Standard.

To determine whether or not an action is EbA, the measure must meet the following three criteria:

- Is the approach focusing on tackling a climate induced threat?
- Is the proposed/implemented solution to climate threats based on (or include elements) of restoration/conservation/ management of ecosystems to maintain/ enhance ecosystems services?
- Does this approach provide biodiversity benefits?

Box 3 Is it Ecosystem-based Adaptation or Community-based Adaptation?

A common example is that communities that experience flooding from rivers due to changes in precipitation patterns may adapt to the floods by raising their houses on stilts, such as in Kong Krailat District in the Yom River Basin. While this helps the residents to avoid infrastructure damage from flooding, it is not an EbA, because there is no conservation, management or restoration of ecosystems, and the measure does not result in improved ecosystem services nor in a net gain to biodiversity (see NbS definition in Section 2). This action would be classified as Community -based Adaptation.

If, alternatively, the stakeholders within the river basin decided to address flooding and damage to infrastructure by reconnecting upstream wetlands to increase water retention in the basin, and thus reduce the volume of water flowing downstream, this would be considered an EbA measure. The measure has restored a wetland, reconnecting it to the river, and likely increased aquatic habitat and biodiversity.

Both approaches are valid and often compatible when planned in a coordinated manner.

Figure 4 *Example of Community-based Adaptation in the Yom River Basin*

Box 4 EbA and grey infrastructure

Grey infrastructure in the water sector refers to structures such as dams, embankments, seawalls, roads, pipes or water treatment plants. Green infrastructure is a synonym for Nature -based Solutions, and can also be a synonym for EbA when it tackles climate threats. Green infrastructure can include forests, floodplains, wetlands and soils that provide additional benefits for human well-being, such as flood protection and climate regulation.

For decades, grey infrastructure has been seen as the main approach to tackle local issues or support development. With the growing recognition of the potential of Nature-based Solutions, or green infrastructure, the issue of compatibility of both approaches has been a key topic for developers and decision-makers.

While both approaches can tackle societal challenges, grey infrastructure is still often seen as a more rapid way to solve issues, with Nature-based Solutions usually taking more time to provide outcomes. On the other hand, Nature-based Solutions often lead to more robust solutions, directly tackling the climate risk and providing a diversity of benefits, beyond the main objective for which they have been developed. For example, the restoration of a wetland to tackle flooding and water storage can also support groundwater recharge and provide biodiversity benefits. A concrete dam will most often not provide additional benefits, or will provide them in a more limited way than natural ecosystems.

Evidence also highlights that in the long term, NbS are often more cost-effective as they do not require heavy maintenance costs, as is the case for grey infrastructure. In addition, cost-effectiveness studies may find that NbS have fewer externalised costs, such as pollution, when compared to traditional approaches. This full cost estimation may provide additional support for implementing NbS over traditional approaches.

In practice, it is commonly accepted that both approaches often form part of the same landscape- level strategy to adapt to risks and pressures. A system/landscape scale analysis will enable the identification of areas requiring urgent actions and identify space for more long- term and transformative solutions, provided by NbS. This approach needs to rely on a clear analysis of risks, and in-depth cost-benefit analyses for each option. Conflicts and trade-offs between approaches also need to be identified and mitigated.

Box 4 EbA and grey infrastructure

An example is a river basin that faces recurring floods and droughts. Immediate risks to human lives and infrastructure must be urgently tackled in urban areas and can use grey infrastructure such as dikes and embankments to provide immediate protection. A complementary approach is to identify the space for NbS in the basin, for example the possibility to restore upstream wetlands and floodplains to decrease the flood risk. In the long term, these NbS will reduce the strength, speed and occurrence of floods, decreasing the overall flood risk in the area. The combination of immediate solutions (grey infrastructure) and long-term transformative approaches (NbS) will enable a full scope of adaptation. As grey infrastructure is developed, its impact on green infrastructure needs to be assessed to ensure that one approach does not lead to a limitation for the other.

In addition, and in a number of cases, grey and NbS infrastructure can be merged to develop complementary hybrid solutions. A classic example is provided by water sanitation approaches, combining the use of water treatment plants and natural or artificial wetlands to support water purification before or after the treatment. Bank erosion management can also be tackled through a combination of grey-green infrastructure using rocks, concrete and plantation. Overall, the long-term vision for solving societal challenge is to progressively shift toward more NbS approaches and less grey infrastructure. Keeping in mind the use of grey infrastructure for situations requiring immediate outcomes will likely always remain part of any adaptation strategy.

1.4 Thailand – which context for EbA in the water sector?

1.4.1 Overview of climate change in Thailand and impacts on the Thai water sector

Thailand is one of most vulnerable countries in the world to the impacts of climate change (Global Climate Risk Index 2019). The country's long coastline, densely populated urban areas and high dependency on agriculture in rural areas increase the potential impacts of climate change to both biodiversity and society.

Over the last 40 years, Thailand has experienced an increase in temperature, coupled with changes in rainfall patterns, leading to impacts on water availability for ecosystems, agriculture and household use. There has been a significant increase in minimum temperatures at Thai meteorological stations from 1961-1998, coupled with an overall increase in the number of warm nights (Manton et al. 2001). Studies have also documented an increase in annual precipitation in Thailand, with the majority of the increase coming during the wet season (Lacombe et al 2012). A 2016 analysis also found that while precipitation events across the country have become less frequent, individual events have increased in intensity (Limsakul & Singhruck 2016).

Changes in rainfall and increased storm severity can be seen in the 2011 flood in Thailand, which was the worst ever flood on record, affecting 66 of the 77 provinces in the country. The flooding impacted more than 13 million people, and led to the loss of nearly 900 lives. In 2012, the World Bank reported that the flooding led to US$46 billion in damages, leading the country to take out $14 billion in loans to address the damage (World Bank 2012). Following the 2011 flood, Thailand experienced a period of recurring and prolonged droughts from 2015-2016, which impacted water availability in reservoirs across the nation. This, in turn, led to significant impacts on agricultural yields, threatening national food security as well as local livelihoods of small-scale farmers.

1.4.2 EbA for the Thai Water Sector

Historically, the Thai government has relied on grey infrastructure, such as concrete dams, weirs, and bank reinforcements, to minimize the extent and impact of flooding and drought in river basins throughout the country. While grey infrastructure has been successful, to some extent, it often requires high costs for maintenance over time, and has adverse impacts on ecosystem services and biodiversity. For example, while dams can retain water in reservoirs for dry season and reduce downstream flooding, they also block fish migration, negatively impacting both biodiversity and fisheries (Baird et al 2019). The negative impacts of grey infrastructure can be seen directly in Baan Kong, Kong Krailat District, in the Yom River Basin, where upstream dam development and bank reinforcement has increased the velocity of water moving downstream, and caused structural damage to traditional houses built on stilts (Figure 5). Further, changes in the flood regime have altered available fish habitat, leading to decreases in catch and leading local fishermen to seek alternative employment.

Figure 5 *Traditional house on stilts opposite concrete bank reinforcements in Kong Krailat District*

1.4.3 Overview of water, natural resources and climate change related policies of relevance to EbA

The Thai government has developed a number of policies related to water resources and climate change to reduce future impacts of changes in temperature and precipitation.

Thailand's updated *Nationally Determined Contribution (2020-2030)* explicitly mentions the application of Integrated Water Resources Management (IWRM) and Ecosystem-based Adaptation practices, but does not explain how these approaches will be used to strengthen ecosystem services, nor does it specify which ecosystems will be targeted. However, the *NDC Roadmap (2021-2030)* provides more detail, specifically mentioning EbA actions such as community-based forestry and integrated coastal zone management. The NDC also makes reference to tools for Climate Change Vulnerability Assessments in six sectors under the country's National Adaptation Plan, namely: water resources management, agriculture and food security, tourism, public health, natural resources management and human settlements and security, highlighting the multi-sectoral impacts of climate change.

Thailand's *National Adaptation Plan (2018-2037)* focuses on context-specific issues impacting various sectors and regions of the country. The NAP promotes wide buy-in to the adaptation planning process by targeting the six priority sectors mentioned above. The Plan highlights the potential for the sustainable management of natural resources and biodiversity to support adaptation to climate change.

One of the key policies that fed the development of the NAP was Thailand's *Climate Change Master Plan 2015-2050* (CCMP), which guides the country's climate change response. The policy focuses on climate change adaptation, mitigation and the development of an enabling environment to strengthen the country's ability to reduce risks from climate change. In Strategy 1, the policy highlights the importance of integrated water resources management, flood and drought mitigation and adaptation and flood and drought risk management for climate change adaptation. The parties responsible for water resources include: Ministry of Natural Resources and Environment (MoNRE), Ministry of Agriculture and Cooperatives, Ministry of Science and Technology, Ministry of Internal Affairs, Ministry of Digital Economy and Society, Ministry of Industry, Ministry of Energy, Ministry of Foreign Affairs and the Ministry of Defence.

The *20-Year Water Management Master Plan (2018-2037*) aims to provide effective management of water resources. It is consistent with EbA principles, mentioning the need for conservation and restoration of quality watershed forests, particularly in areas that experience frequent drought and flooding. The Master Plan does not explicitly mention EbA, nor does it provide any specific guidelines on how to increase climate change adaptation capacity.

The *20-Year Forest Strategic Plan (2017-2036)*, developed by the Royal Forest Department, Ministry of Natural Resources and Environment, aims to increase forest area through the engagement of local communities, focusing on mangrove forests and upstream river basins. This supports both climate change adaptation and mitigation.

1.4.4 Relevant Thai Government Stakeholders for Climate Change and Water Resources

In 2007, Thailand established the **National Committee on Climate Change Policy (NCCC)** to act as a national coordination mechanism to address climate change. The committee is chaired by the Prime Minister, or assigned Deputy Prime Minister, and co-vice chaired by the Minsters of the Ministry of Nature Resources and Environment and the Ministry of Foreign Affairs. The NCCC fosters discussion leading to the formulation of climate change plans and policy for all of Thailand.

The **Office of the National Water Resources (ONWR)** is a regulatory agency established under the Office of the Prime Minister in 2017. ONWR is responsible for giving policy recommendations, preparing strategic plans and master plans, developing implementation measures, integrating information, workplans, projects, and budgets, as well as conducting monitoring and evaluation for the entire water management system (Figure 6).ONWR is a key focal point for the Thai-German Climate Change Programme - Water (TGCP - Water).

The **National Water Resource Committee (NWRC)** is chaired by the Prime Minister, whose duties are to integrate the use, development, management, maintenance, restoration, and conservation of water resources to bring about unity in water management.

Ministry of Natural Resources and Environment

The **Ministry of Natural Resources and Environment (MoNRE)** oversees the preservation, conservation and rehabilitation of natural resources and environment, and their sustainable use. This includes water resources, and the organisations responsible for their management, which are spread across a number of different ministries.

The **Office of Natural Resources and Environmental Policy and Planning (ONEP)** is the organization that develops climate change policies in Thailand. The Climate Change Management and Coordination Division, within ONEP, leads the work on managing, preventing, and solving climate change issues in Thailand. The Biodiversity Management Division is also within ONEP, highlighting a link between climate change and flora and fauna in the country.

There are several departments in MoNRE that are directly related to water management, including the **Department of Groundwater Resources** and the **Department of Water Resources**, which is responsible for the management of small and medium scale reservoirs. The **Royal Forest Department (RFD)**, is also under MoNRE, and is responsible for developing forest policies that can influence river basin management planning and water availability. The **Department of Marine and Coastal Resources (DMCR)**, focuses on coastal and marine flora and fauna, particularly mangrove forests, coral reefs and seagrass beds, and their conservation and restoration.

<u>Ministry of Agriculture and Cooperatives</u>

The **Ministry of Agriculture and Cooperatives (MoAC)** is responsible for developing agricultural policies, and is one of the oldest ministries in Thailand. It hosts the **Royal Irrigation Department (RID)**, which works on ensuring the sufficient development of water resources based on the needs and capacities of each watershed, allocating water to all water users with fair and inclusive manners, as well as preventing damage caused by water. The **Office of Agricultural Economics (OAE)** is operated under the MoAC. The office is in charge of compiling and disseminating the agricultural information report as well as studying and the agricultural economics.

<u>Ministry of Interior</u>

The **Ministry of Interior (MOI)** is a cabinet-level department of the Thai government. The ministry is responsible for a variety of tasks ranging from disaster management, road safety, land management and public works to internal security, citizenship and local administration. **Department of Disaster Prevention and Mitigation (DDPM)** is the core department of disaster management under the MOI working on developing information technology system for disaster prevention and implementing disaster risk reduction mechanism. In collaboration with Thai Meteorological Department, DDPM also supports the development of climate forecasting technology that will be the tool to forecast the occurrence of extreme weather events.

<u>Ministry of Digital Economy and Society (MDES)</u>

The **Thai Meteorological Department (TMD)** is responsible for weather forecasting, meteorological observations and data collection and analysis, and is thus a particularly relevant stakeholder when conducting work on both water and climate change adaptation.

The current organisation of the Thai government effectively recognises and responds to the fact that climate change is a cross-sectoral issue that must be managed as such. However, there is room for improvement in recognising that a similar approach must be taken for NbS, and particularly NbS for water, which will require multi-sectoral collaboration and cooperation.

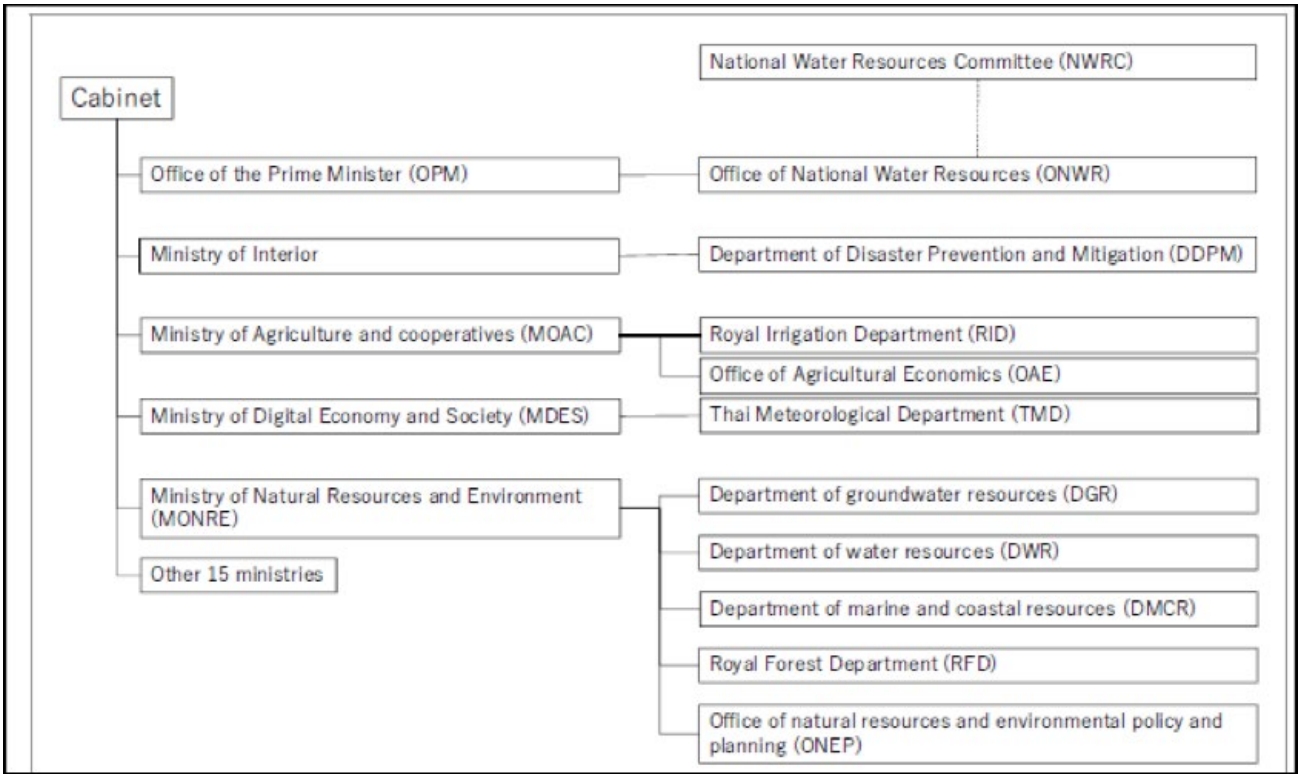


Figure 6 *Diagram of the major government organisations involved in adaptation in the water sector (Kiguchi et al 2021)*

1.4.5 Policy mainstreaming and entry points

Thailand's governance strength is that the national government has designated the Office of Natural Resources and Environmental Policy and Planning (ONEP) to be directly responsible for climate change action, and the country has ratified the UNFCCC. This provides a focal group of government experts and leaders who are developing policies and regulatory frameworks to support the design, implementation and monitoring of EbA. Led by ONEP and ONWR, Thailand can increase awareness of the benefits that EbA can deliver, while also promoting cross-sectoral collaboration and policy coherence on climate change adaptation and water, engaging all relevant ministries, including transportation, construction, finance, investment and disaster risk management, among others. The development of an inter-ministerial committee, specifically focusing on EbA for water, could further promote and develop policies that strengthen the integration of NbS into national policies.

Despite the significant progress to date, more concrete, evidence-based targets for EbA are urgently needed. Thailand's NDCs and NDC Roadmap only makes a generic mention of either NbS or EbA, and do not specify any quantifiable or robust targets. This suggests that considerable potential remains for Thailand to strengthen the role and monitoring of NbS in future NDCs, and in policies and strategies contributing to the achievement of the NDC. The aforementioned IUCN Global Standard for Nature-based Solutions provides a common framework to help benchmark progress that can further support Thailand's planning around NbS implementation. The output of the self-assessment provides a percentage match compared against good practices, with outputs that identify areas for increasing adherence to the IUCN Global Standard.

Moving forward, decisions about climate change policies should be based on the best available scientific evidence and data. In Thailand, this can be supported through collaborations with regional centres, such as the Mekong River Commission, which can support research and knowledge exchange to develop long-lasting and sustainable EbA measures at both the national and regional levels. There is also potential to strengthen national -level collaborations with research institutions, such as the Thai Meteorological Department, Hydro-Informatics Institute or the Geo-Informatics and Space Technology Development Agency. Decision -making should be based on inter-agency cooperation within the government itself, to further break down silos between agencies, which could include the development of cross-sector working groups to better understand and align plans on water management, conservation, Disaster Risk Reduction and infrastructure plans. The working groups could also foster and promote the joint funding of projects that provide nature and water management benefits, or develop requires for future procurement proposals to consider NbS as a priority, where possible. At the national level, EbA tools can be officially endorsed by government to promote their uptake, and increase the implementation of EbA measures.

1.4.6 Technological solutions

New EbA approaches can be coupled with strengthened technological applications, such as geographic information systems (GIS), early warning systems, remote sensing and hydrological and hydraulic modelling, among others, to help gather evidence on the benefits and provide information needed to design and implement EbA. EbA can also be used as part of a hybrid technology solutions, where ecological principles are merged with 'hard' technology or infrastructure to increase the advantages or reduce the limitations derived from using one approach as a stand-along strategy, such as the restoration of wetlands to support water treatment plans. New technologies developed must be scalable for integration into national policy and strategy, and applied in a range of ecosystems. Many decision-makers still understand EbA mainly as reforestation and mangrove planting, and are unaware of the diversity of options, particularly when considering the potential of EbA in urban environments.

1.4.7 Financing EbA

To effectively implement climate adaptation activities and strengthen resilience, there is an urgent need to scale-up finance and investments for EbA in Thailand. This can be achieved through existing multilateral donors, such as the Green Climate Fund and the Global Environment Facility, which have supported, and continue to support the development and implementation of EbA in Thailand. There is also a growing interest from the private sector to engage in the application and design of EbA. This could result in additional funding for EbA, through payment for ecosystem services schemes, ecotourism, or other innovative approaches, and public-private partnerships.

Part 2

From theory to practice: steps for EbA development and implementation in river basins

Part 2 of the Guidebook leads readers through the continuous cycle of understanding the context for EbA, developing and implementing measures and monitoring, and mainstreaming the lessons learned. There are eight key steps in the process (Figure 7) all of which aim to ensure that the EbA measures are based on the best available data, and include local stakeholders throughout the entire process. It is estimated that the process will take a minimum of 18 months, depending on the duration of monitoring and the time required to integrate the lessons learned into policy (Table 1); in many cases, EbA implementation may take place over the long-term, so that M&E and lessons for policy could continue well beyond 18 months.

The design of the steps and of the overall approach integrates learning and guidance from the IUCN Global Standard on NbS (Box 1)

The first step includes a thorough stocktaking and preliminary assessment of available information in the focal area. This is followed by a climate change vulnerability assessment to understand the current and future climate threats and vulnerable areas. Following the vulnerability assessment, stakeholders and project implementers will map the key ecosystems and ecosystem services with the focal area to understand how ecosystem conservation, management or restoration can help to tackle climate issues. In Step 4, the information gathered in Steps 1-3 is used to inform the development of an EbA vision for the focal area, highlighting the community aspirations. The vision will guide the development of a Theory of Change and identification and validation of EbA measures in Step 5. In Step 6, the implementation teams will develop a Monitoring and Evaluation (M&E) framework to support the monitoring and evaluation of the selected measures. The EbA measures are implemented in Step 7. Finally, in Step 8, the results of the evaluation should be used for adaptive management and to further influence relevant policies at both the local and national levels.

While implementing each of the steps, environmental and social safeguards should be integrated throughout the EbA process (Box 2). It is essential that Indigenous Peoples and Local Communities (IPLCs) and other local stakeholders are involved in each step of the process, that negative environmental impacts are avoided or reduced, that information is shared transparently, and that appropriate grievance mechanisms are established so that stakeholders can voice their concerns at any step of the process. Another essential component of implementing EbA is to ensure the building of local capacity throughout the project. This is key for promoting local buy-in and securing the long-term success of the measures. Finally, EbA must be mainstreamed in relevant government agencies, policies and practices within the basin.

Part 2 of the guidebook should be used alongside both the Climate Risk and Vulnerability Assessment (CRVA) and the EbA Code of Practice (COP), simultaneously developed under the Thai German Climate Programme (TGCP)-Water, to help guide the process of implementing specific EbA measures in river basins in Thailand. Where possible, EbA planning and implementation teams should include participants from the Capacity Development Programme (CDP) on Integrated Water Resources Management (IWRM) and Ecosystem-based Adaptation. The CDP participants have been trained on the history and theory of EbA, and have an understanding of the overall global context, and can apply this knowledge at the national and local levels.

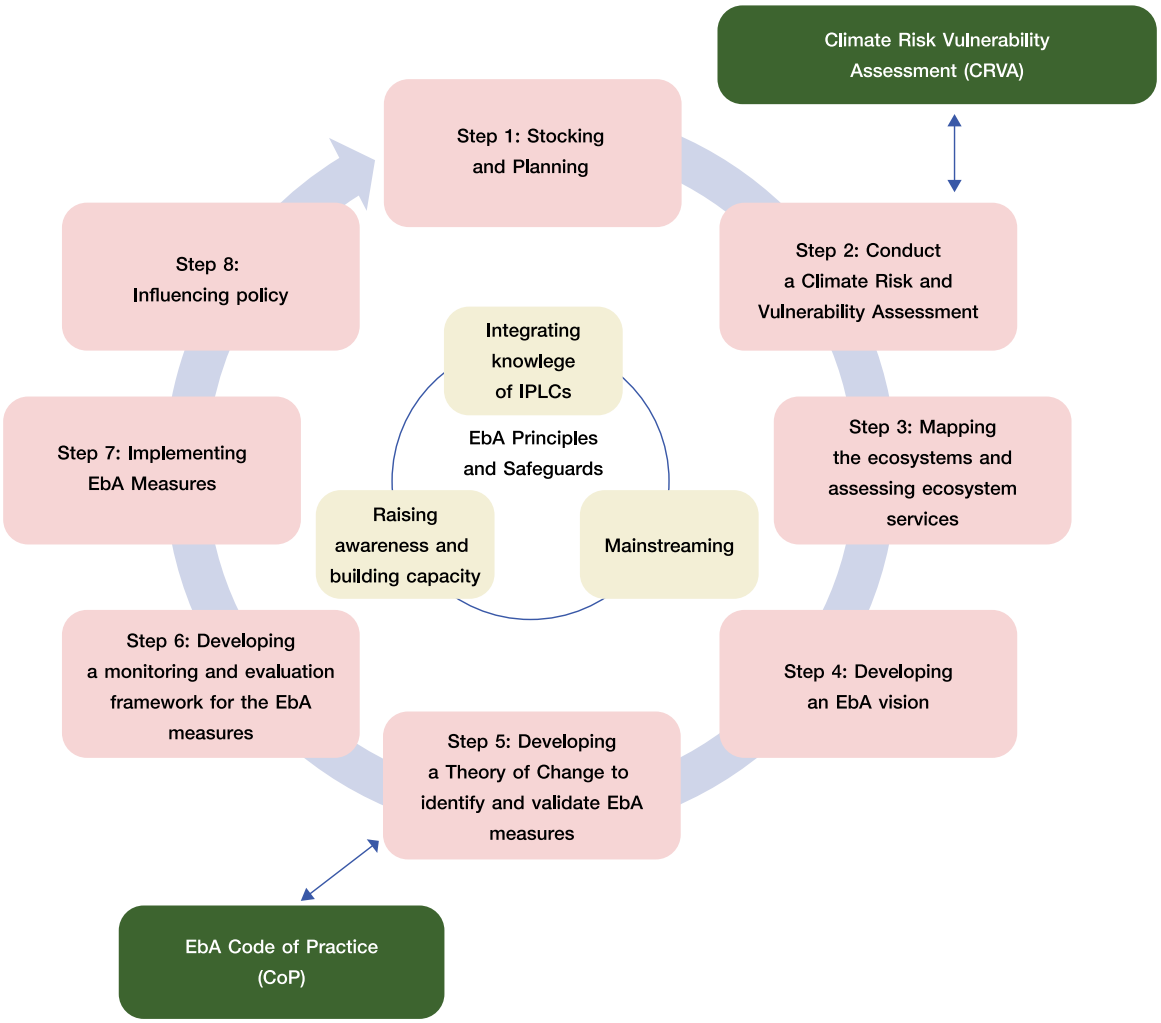
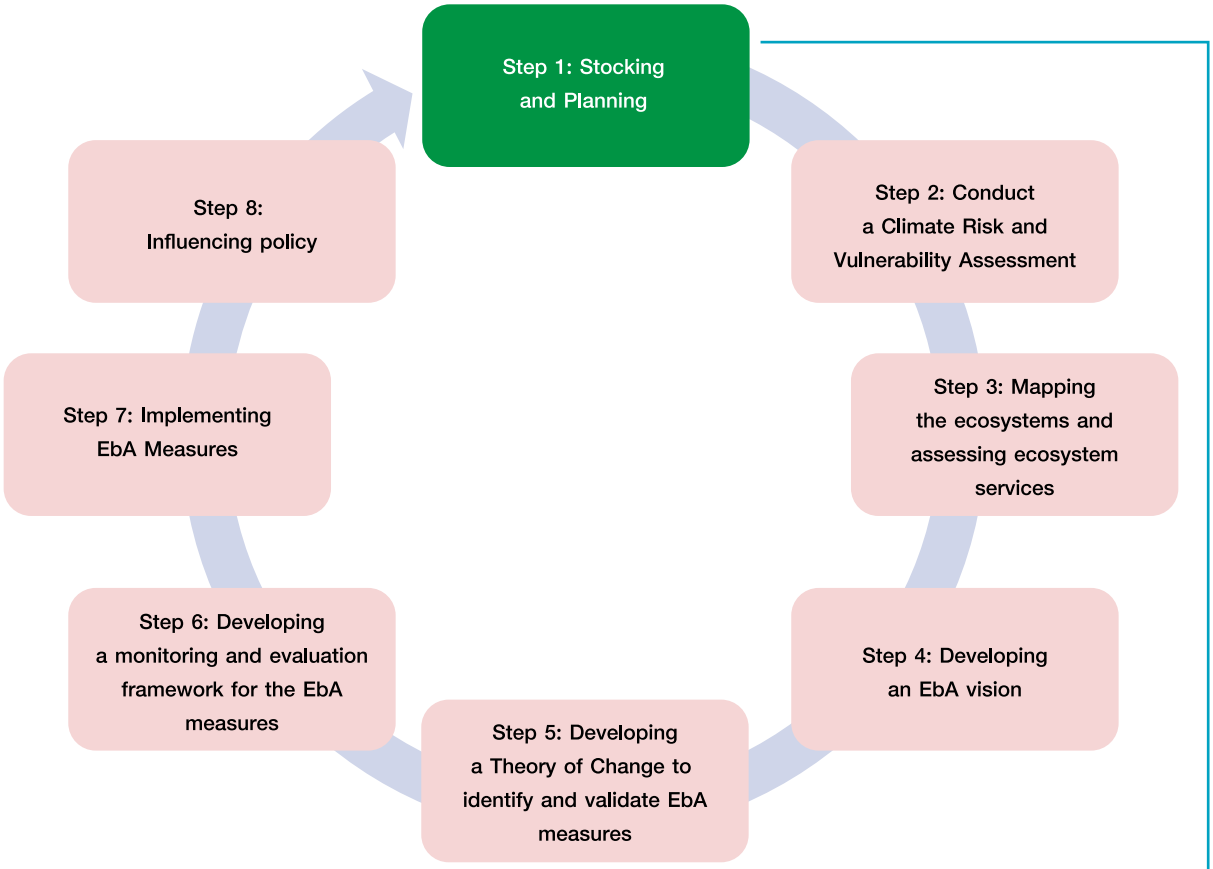


Figure 7 *Process of planning and implementing EbA as part of a climate change adaptation strategy (Adapted from: Secretariat of the Convention on Biological Diversity (2019)).*

Table 1 *Indicative timeline for implementation*

Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Step 1																		
Step 2																		
Step 3																		
Step 4																		
Step 5																		
Step 6												Ongoing-->						
Step 7												Ongoing-->						
Step 8													Ongoing-->					

Step 1:
Stocktaking and Planning



1. Determine the focal area for the intervention
2. Develop a core project team
3. Conduct a literature review of existing knowledge on the site
4. Conduct a stakeholder analysis
5. Organise initial community consultations
6. Hold a stakeholder consultation workshop on capacity building needs
7. Summarize key elements in a brief summary

Objective: This initial step aims to develop a preliminary understanding of the societal challenge to be addressed, to understand planned and ongoing measures in the focal area, and pre-assess whether EbA can potentially address climate impacts at the site and possible EbA approaches to be developed.

The stocktaking and planning step is the first step in understanding the space for EbA in the focal area. The key outcome is an initial problem analysis based on a comprehensive literature review and identification of stakeholders, the societal challenges they are facing and potential opportunities in the focal area. During this step, the planners and stakeholders will reach a consensus on whether EbA is a relevant approach to address the climate change impacts in the basin, how it will be integrated within a broader climate change adaptation strategy, and will begin to identify potential EbA approaches and the appropriate temporal and spatial scales at which to work, which will be refined in later steps.

If EbA is determined to be a relevant approach to address the impacts in the focal area, the implementing team will lead stakeholders in developing a preliminary EbA vision to lead the implementation process.

Before starting, it is important to assemble an implementation team that will drive the process from the beginning until the end of the intervention. The team should ideally be gender balanced and include representatives of River Basin Committees, CSOs, representatives of water user groups, academia, governments, ecologists with knowledge of natural resources and at least one member who has experience working on community engagement. Senior experts can also be consulted to share their experience from implementing EbA measures in other river basins. Facilitating community consultations in a way that supports a sense of ownership of the EbA development process will be essential for ensuring long-lasting, effective solutions.

The preliminary stage focuses mainly on a thorough stocktaking of information about the focal area. The stocktaking should include a desktop review of the literature, in which the project team will analyse existing data, including past climate trends and future projections. The team should also gather information about any previous or planned grey or green measures in the focal area that aimed to address climate impacts or that are relevant to EbA. If these have been previously implemented, the team should also seek to understand their effectiveness in strengthening resilience. The review should also note gaps in the data available that will need to be filled in order to design effective EbA measures. A thorough review of the existing literature will prevent duplication of efforts.

Next, the project team should organise a consultation with stakeholders to review the information gathered, and collect additional information to fill the gaps identified during the literature review. After the team has a comprehensive understanding of the basin, they will lead the stakeholders in developing a preliminary EbA vision to guide design and implementation of EbA measures. The EbA visioning will help to document local community aspirations and goals for the future of the focal area, and will serve as a foundation for the project team and stakeholders to select measures that can increase resilience to climate change and deliver other benefits. The preliminary EbA vision will be further refined in Step 4 based on the data collected in Steps 2 and 3.

Activities

1. Determine the focal area for the intervention

The focal area is generally selected based on recent climate-related impacts that have led to impacts on local livelihoods or infrastructure, such as significant floods or extended droughts that have negatively affected agriculture or fisheries. EbA design must take into account the interactions that occur across different social and ecological scales within a landscape. As this is the first step in the process, the selection of the focal area can be relatively broad, identifying, for example, a focal basin, with the specific ecosystems and areas to implement EbA being further refined in later steps, while continuing to consider the larger landscape in decision-making.

2. Develop a core project team

Approximately ten people—members should include representatives from:

- River basin committees
- Government
- Natural resource specialists
- Community engagement specialists
- Academia
- NGOs

Where possible, ensure that at least one member of the team has completed the ONWR and GIZ Capacity Development Programme. If no one on the team has participated in the CDP, an important first step is to understand any capacity building needs within the team, and methods to address them, before progressing with EbA implementation process. ONWR and GIZ Thailand can provide resources and trainings through the training of trainers. IUCN can also provide training on the Global Standard for Nature-based Solutions and provide examples of case studies on NbS for water from the region.

• Form 1A: Project team members and roles

3. Conduct a literature review of existing knowledge on the site. The literature review should provide a basic assessment of information and highlight the key data gaps that need to be addressed before moving forward with the planning and design process. Documents should include:

- **GIS maps of land use in the focal area/ basin.** These maps should use the most recent information available and be combined with ground-truthing and compared to available high resolution satellite images, to verify the results, where possible. The Land Development Department produces a nationwide land-use map once every two years, classifying land use into five major categories including: agricultural land, forest land, urban and built-up land, water bodies and miscellaneous, and further divided into 33 subclasses (Annex 1). This can be used if there are no other sources available for the focal area.

• **Hydrological data for the focal basin.** Any relevant studies or maps of the baseline hydrology at the site, including river basin profiles should be gathered to understand the historical and current status of water flow and quantity or quality in the basin.

• **Biodiversity surveys of both flora and fauna in the surrounding areas.** EbA measures should aim to conserve or restore ecosystem integrity, and provide biodiversity benefits. Species listed on the IUCN Red List as Vulnerable or higher, species listed in the Thailand Red Data, endemic species and species that are economically important for local livelihoods should be documented and given special consideration in the EbA development process. If there are no existing studies of flora and fauna, one should be conducted during the preliminary phase by experts with knowledge of the area, and budget allocated for this. In some areas, local universities or NGOs may have ongoing biodiversity research projects, and there may be opportunities to partner with these projects to save costs and time. Understanding the habitats and resources used by rare or economically important species, and the climate change threats to their habitats, will help to design EbA measures that have a positive impact on biodiversity.

• **Climate change historical data, projections and vulnerability assessments.** Climate change historical data, and projections for the basin or province should be reviewed to understand the future climate at the focal site. Where possible, Global Circulation Model data should be complemented with higher resolution regional simulations. Because of the abundance of literature in the field, it is recommended to first search for and review any literature of climate change in Thailand before downloading and processing raw model data. If there are existing maps of historical flooding and drought in the project area, or maps of changes in the rates of precipitation, these should also be collected from the Land Development Department, Department of Water Resources or the Office of National Water Resources, and analysed. If any climate change vulnerability assessments have been completed in the basin, or nearby areas, it is useful to review these to get an understanding of the key threats to the area and how different stakeholder groups may be affected. If this information is not available, Step 2 on conducting a vulnerability assessment, will be critical.

• **Development plans influencing the focal site and wider landscape.** Understanding ongoing and future development plans for the focal area is important to avoid wasting time on redundant or unnecessary EbA measures. There is a need to review plans by the Department of Public Works and Town & Country Planning, the Royal Irrigation Department, the Department of Water Resources, the Office of Natural Resources and Environmental Policy and Planning, the River Basin Master Plan, and other relevant departments and development agencies to get a general overview of planned actions in the basin and understand whether there is a need and the space for EbA to be implemented. Ideally spatial land use plans and infrastructure plans should be obtained.

• **Natural resources management policies influencing the site.** A review of natural resource management policies is important for the project team to understand the site context. The implementing team should review policies governing water resources management, irrigation, fisheries, coastal management, disaster risk reduction and other relevant policies.

• **Review of the social and environmental challenges in the focal area.** The implementing team should gather information about the challenges local communities are facing in the focal area, to determine the most pressing challenges they are facing. This can include statistics on poverty, education or gender inequities in the area, or can also highlight pollution, deforestation, or other environmental degradation that is impacting local stakeholders.

• **Evidence of needs/priorities from water users.** If stakeholders have previously been engaged in consultations with government agencies, development agencies, or other project implementers, a review of the results of these consultations can allow the team to build on these answers in the development of the EbA measures. In particular, these needs and priorities may have been documented by ONWR, and appear in the River Basin Master Plan. Avoiding the duplication of efforts will save both time and money, and streamline the process of EbA development.

• **Review of ongoing and previously implemented interventions.** In order to effectively understand the focal site, project implementers should review historical and ongoing interventions, both grey and green, that were implemented in the focal site and surrounding area. If efforts have been successful, there is an opportunity to scale-up the intervention and use it to address the societal issues a community is facing. If the interventions were unsuccessful, whether because of technical, political, cultural or other reasons, this is important information to inform project development and avoid making similar mistakes.

Form 1B: Literature Review Results

4. Conduct a stakeholder analysis of the focal area. This should include:

• Government agencies responsible for water management, climate change and disaster risk management at the national, provincial and local levels;

• River Basin Committees;

• Indigenous Peoples and Local Communities (IPLCs), rights holders and other stakeholders who are likely to be impacted by EbA interventions;

• Non-profit organisations working in the area;

• Private sector interests who influence planning and implementation.

Form 1C: Stakeholder Analysis

5. Organise initial community consultations to understand:

1) The issues local communities are facing;

2) Community-led and government plans to address the identified issues;

3) Coping mechanisms for present and future climate threats;

4) Challenges and needs

 **Form 1D: Initial Community Workshop**

6. Hold a consultation workshop with all identified stakeholders in the focal area to assess capacity building needs and opportunities to use EbA to mitigate climate change impacts in the river basin:

1) Identify preliminary capacity development needs for stakeholders to implement EbA in the basin. Topics should include:

a. Designing, implementing, monitoring and evaluating EbA, particularly best practices in the water sector;

b. Integrated Water Resources Management (IWRM);

c. Grey/green infrastructure;

d. Climate change impacts on water availability in the region and disaster response or management capacities;

e. River Basin Master Planning Process in Thailand.

2) Based on the capacity development needs assessment, develop a timeline for building sufficient capacity amongst stakeholders to be able to implement EbA in the river basin. This can be through peer-to-peer trainings, reviewing guidebooks or additional literature, or reaching out to development partners to request support in capacity building on specific topics.

3) Develop a preliminary EbA vision with stakeholders, using the understanding of the main challenges in the basin and the aspirations of the community to guide the development of the vision. The vision should highlight long-term goals of the stakeholders, in an ideal, best-case scenario. It will be further refined in Step 4.

 **Form 1E: Example agenda for a one-day consultation workshop with stakeholders**

 **Form 1F: Preliminary capacity building needs assessment**

 **Form 1G: Drafting a preliminary EbA vision**

7. Summarize key elements in a brief summary

The summary should be a maximum of five pages, including what is known about the societal challenge, policies governing the site, past or planned interventions, needs of the community and stakeholders and the capacity of ecosystems to address the challenge, and the preliminary vision.

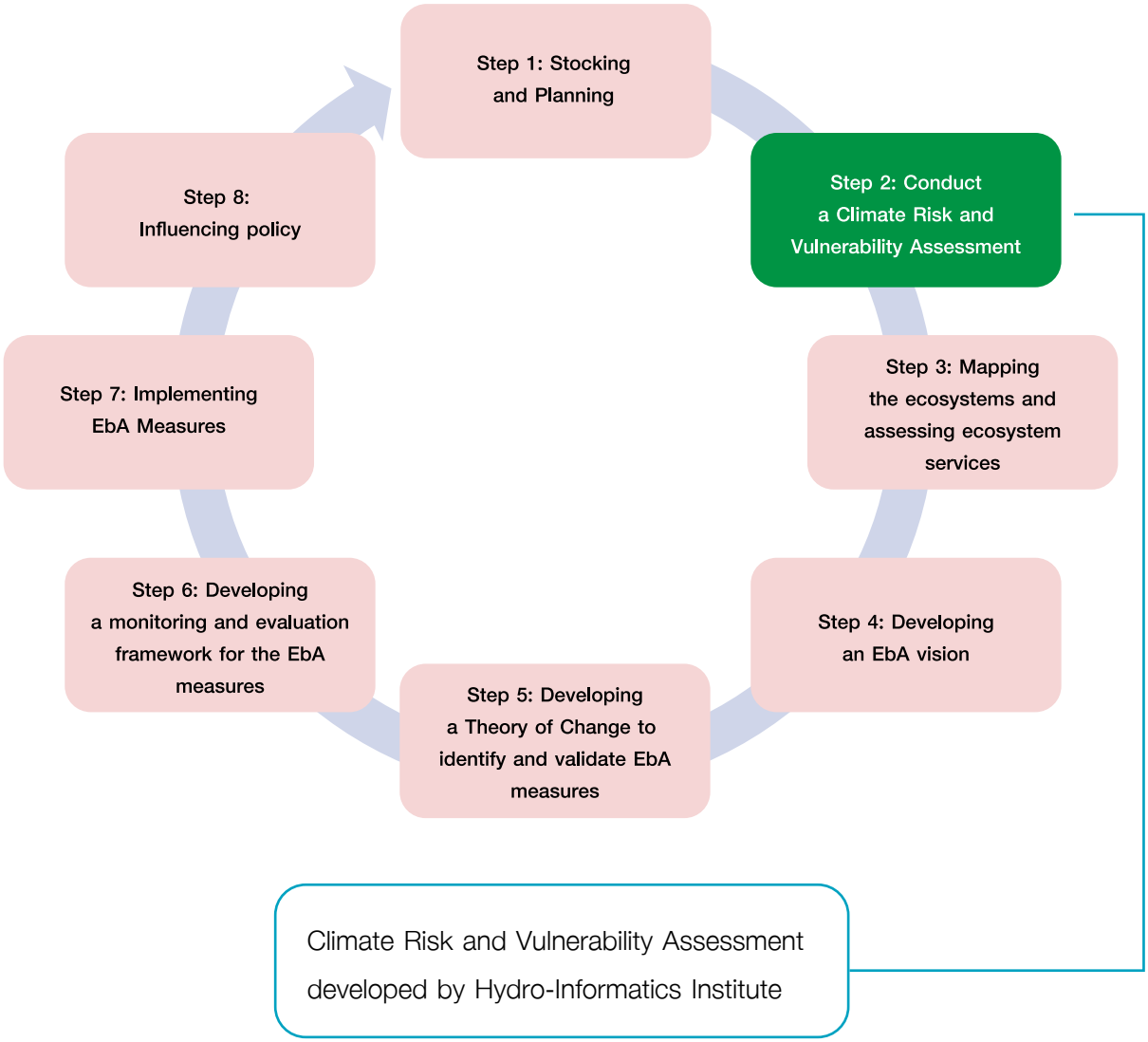
 **Form 1H: Template for five page summary**

Outputs

1	Literature review
2	Stakeholder analysis
3	Preliminary assessment of capacity building needs to effectively implement EbA
4	List of key knowledge gaps and plans to address them
5	Preliminary EbA vision
6	Summary of information gathered in preliminary stage

If the focal area does not yet have a Climate Risk and Vulnerability Assessment that highlights water-related risks from climate change, proceed to Step 2: Conduct a Climate Risk Vulnerability Assessment. If a Climate Risk Vulnerability Assessment has already been completed for the site, summarise the key elements in Form 2A and skip to Step 3: Mapping the Ecosystems and Assessing Ecosystem Services.

Step 2:
Conduct a Climate Risk and Vulnerability Assessment



Objective: The Climate Risk and Vulnerability Assessment (CRVA), developed by the Hydro-Informatics Institute (HII) uses information about the basin and climate projections and models to highlight the focal area's climate change vulnerabilities. The results will be used to inform the objectives and content of the adaptation strategy and EbA measures.

Climate Change Vulnerability

Step 2 aims to provide an in-depth understanding of the climate risks and vulnerabilities within the focal area. Vulnerability assessments are a key tool to help decision-makers and planners understand the susceptibility of a natural or human system to damage from climatic and non-climatic threats. The results of these assessments highlight key entry points where implementers can direct their efforts to address the most pressing threats to both ecosystems and communities, thus increasing resilience (Box 5). In regards to EbA for water, the key climate driver of change will be changes in rainfall patterns within the focal basin; temperature change is also an important influencing factor, as are observed and projected changes in the frequency and intensity of extreme events.

The Intergovernmental Panel on Climate Change defines **vulnerability** as "the propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt" (Oppenheimer et al. 2014).

Exposure is the presence of people, livelihoods, species or ecosystems, environmental functions, services and resources, infrastructure or economic, social or cultural assets in places and settings that could be adversely affected (Oppenheimer et al. 2014).

A **hazard** is the potential occurrence of a natural or human induced event, trend or impact that may lead to the loss of life, injury or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems or environmental resources (Oppenheimer et al. 2014).

Risk is potential for consequences where something of value is at stake and where the outcomes are uncertain. Risk is the result of the interaction between vulnerability, exposure and hazard (Figure 8).

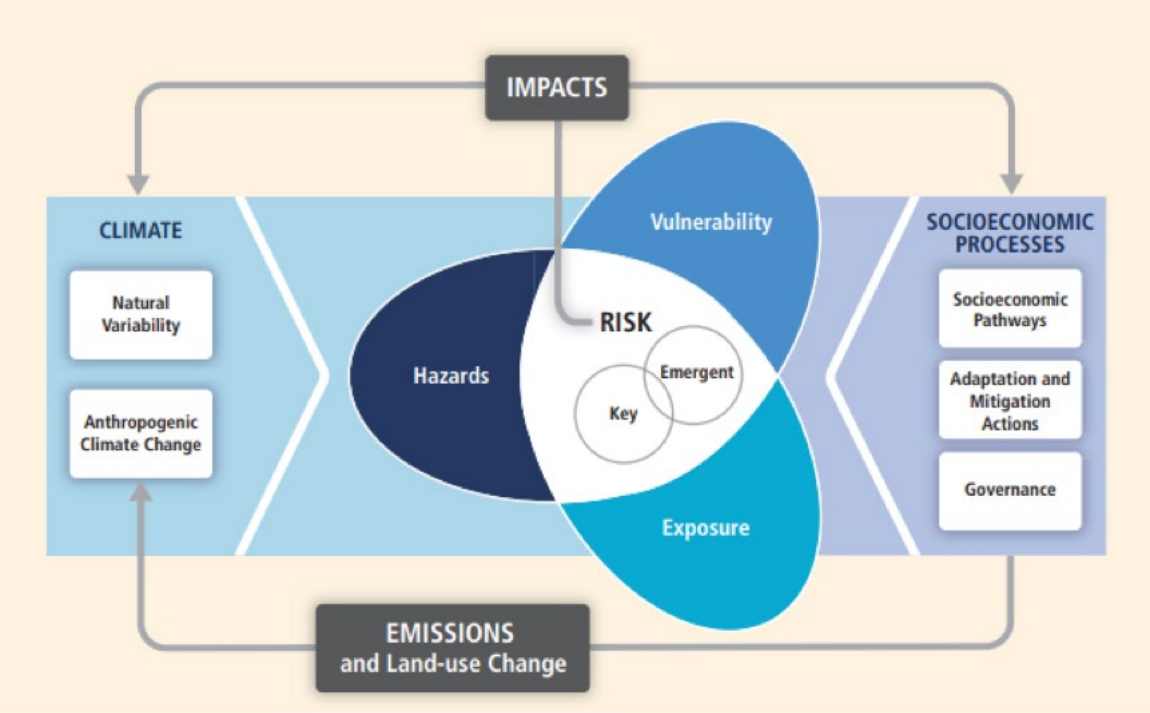


Figure 8 The risk of climate-related impacts is the result of the interaction between climate-related hazards and the vulnerability and exposure of human and natural systems (Oppenheimer et al 2014)

Climate Risk and Vulnerability Assessment

There are a number of vulnerability assessment methodologies that are tailored to specific regions and ecosystems. In Thailand, the Office of National Water Resources, in collaboration with GIZ and the Hydro-Informatics Institute (HII), has studied and developed the Climate Risk and Vulnerability Assessment tool (CRVA) for supporting the development of River Basin Master Plans (RBMP). The tool is based on GIZ's "Climate Risk Assessment for Ecosystem-based Adaptation- A guidebook for planners and practitioners." It takes two to five months to implement and consists of eight main steps and an online tool and consists of:

1. Preparing the risk assessment
2. Developing impact chains
3. Identifying and selecting indicators for risk components
4. Data acquisition and management
5. Normalisation of indicator data
6. Weighting and aggregating indicators
7. Aggregating risk components into a single composite risk indicator
8. Presenting and interpreting the outcomes of the risk assessment

The CRVA uses boundaries of geographic features in the focal area to determine the risks to communities and ecosystems. The tool analyses the impacts of climate change on local lives and livelihoods, assets and ecosystems, and forecasts potential future risks. The CRVA can also be used to inform decision-making for river basin planning.

The CRVA requires engagement between scientific experts and local communities impacted by climate change in the focal area. The resulting data, collected from consultations and analyses will highlight the degree of risk that the focal area is projected to experience, as well as the most pressing vulnerabilities to address.

If the results of the HII CRVA are not available for the focal basin, there is a range of additional tools to support project teams in scoping the vulnerabilities of the site (see *Additional Resources* below).

Figure 9 Researchers collect data for a vulnerability assessment near the Bang Pakong River, Chachoengsao Province

Box 5 Example Vulnerability Assessment Results- Bang Pakong Wetland

The Bang Pakong Wetland is part of the larger Bang Pakong River Basin, southeast of the Bangkok metropolitan area and connected to the Gulf of Thailand. The area represents a unique ecosystem with high biodiversity as result of freshwater, brackish water and saltwater habitats. Despite the expansion of urban areas and industrial development, 70% of local people still depend on the wetland for their livelihood. Intensive land and water use and environmental pollution, however, have put the wetland ecosystem under pressure. Climate change is expected to further exacerbate these problems.

IUCN supported local partners, including ONEP, the Marine and Coastal Resources Research and Development Centre, and university partners in conducting a Climate Change Vulnerability Assessment (CCVA) at the site to understand the potential impact of climate change on the ecosystems, species and livelihoods of community members in the wetland. The CCVAs combined scientific assessments with participatory appraisals and dialogues with local communities and authorities including the Office of Natural Resources and Environmental Policy and Planning.

Results of the CCVA highlight that climate change in Bang Pakong poses a threat to both the health of the ecosystems and the people who rely on them. Climate projections include increased rainfall during the rainy season and decreased rainfall during the dry season, with higher temperatures leading to droughts and increased water salinity. Sea level rise also threatens the two coastal areas, exacerbating coastal erosion rates, flooding and saltwater intrusion.

In Bang Pakong, the estuary, islands and oxbows are highly vulnerable to droughts, floods and rising sea levels and increased soil salinity. These habitat impacts will also affect the species that reside within them. Bang Pakong wetland hosts the critically endangered Somphong's rasbora (*Trigonostigma somphongsi*) a fish affected by droughts, increased temperatures and salinity changes. Also, the endangered giant freshwater stingray (*Himantura chaophraya*), and Irrawaddy dolphin (*Orcaella brevirostris*) are at risk from water pollution, sedimentation, and increasing water temperatures.

Because of climate change, wetland resources in Bang Pakong are declining and water quality is deteriorating. Smallholder farmers that depend on the production of rice, fruits and farmed fish are also at risk from high tides, saline water, drought and higher temperatures.

Once the Climate Risk and Vulnerability Assessment, or another vulnerability assessment, has been completed, the implementation team should use Form 2A to summarize the key risks and vulnerabilities in the focal area.

Form 2A: Summary of key risks and vulnerabilities highlighted in the VA

Outputs

1	Climate Risk Vulnerability Assessment highlighting the vulnerability of habitats, species, communities and stakeholder groups, livelihoods and infrastructure in the focal area

Additional Resources

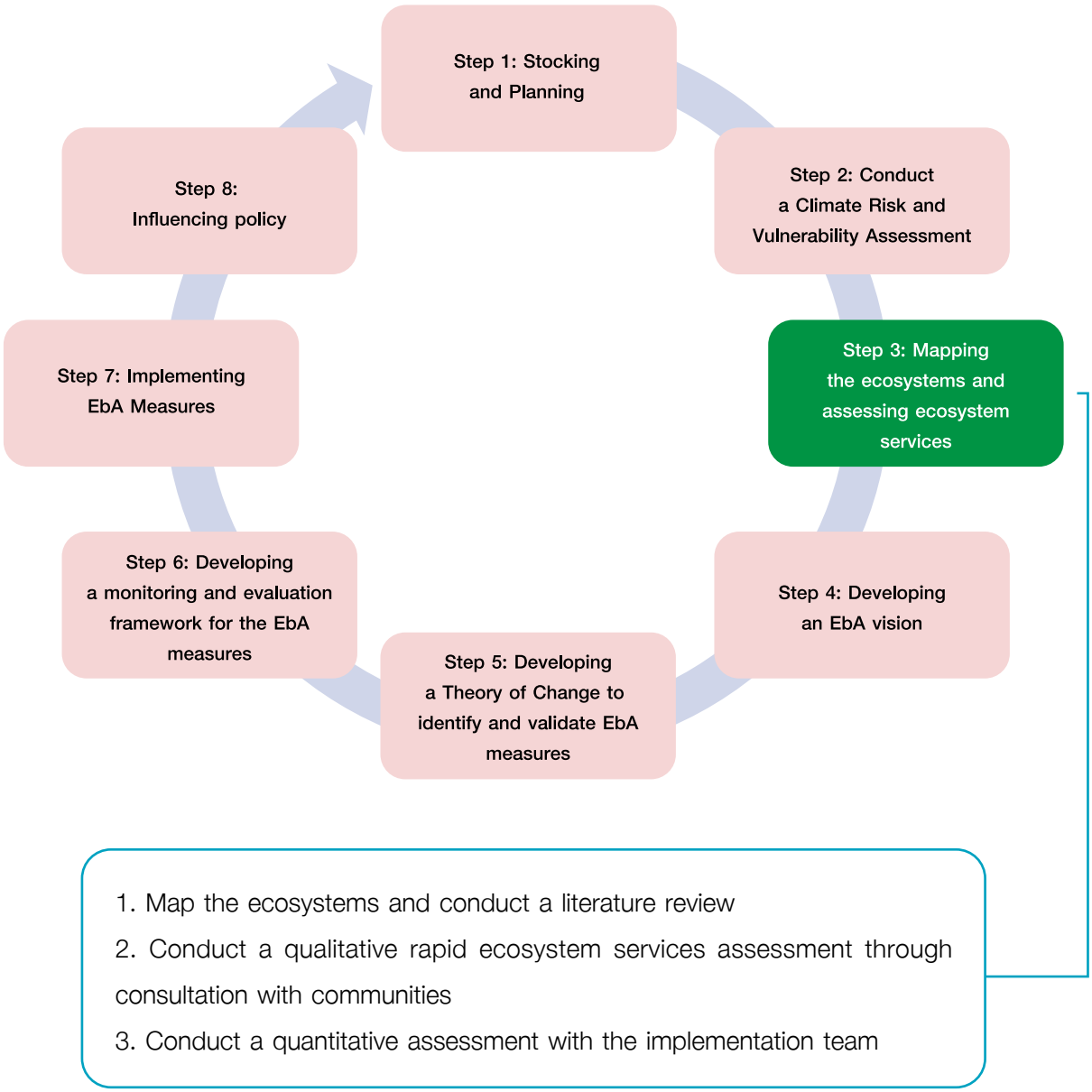
GIZ, EURAC & UNU-EHS (2018): Climate Risk Assessment for Ecosystem-based Adaptation – A guidebook for planners and practitioners. Bonn: GIZ. https://www.adaptationcommunity.net/wp-content/uploads/2018/06/giz-eurac-unu-2018-en-guidebook-climate-risk-asessment-eba.pdf

IUCN (2020). A Methodology for Rapid Assessment of Climate Change Vulnerability and Adaptation Planning at Ramsar Sites. https://www.iucn.org/sites/dev/files/content/documents/vulnerability_assessment_and_adaptation_planning_guidance_note_final.pdf

Oxfam (2016). Finding Ways Together to Build Resilience: The Vulnerability and Risk Assessment methodology. https://policy-practice.oxfam.org/resources/finding-ways-together-to-build-resilience-the-vulnerability-and-risk-assessment-593491/

UNEP-WCMC (2015) Guidance on Integrating Ecosystem Considerations into Climate Change Vulnerability and Impact Assessment (VIA) to Inform Ecosystem-based Adaptation. https://www.adaptation-undp.org/sites/default/files/downloads/viag_guidance.pdf

Step 3:
Mapping the ecosystems and assessing ecosystem services



<u>Objective:</u> Map the ecosystem services in the focal area and use the results from the climate risk and vulnerability assessment to identify the ecosystem services that are key for reducing vulnerability.

In this step, stakeholders will map the ecosystems present, if not already known from the land use map in Step 1. The Land Development Department's nationwide land use maps classify land use into five major categories: agricultural land, forest land, urban and built-up land, water bodies and miscellaneous. These categories are then further subdivided into 33 classes (Annex 1 Land Use Classifications). This data should then be reconfirmed via ground truthing or consultations with stakeholders within the focal area.

A qualitative rapid ecosystem services assessment will be carried out, and will build upon the ecosystem maps and a literature review of ecosystem services, conducted by the project team. Using the information gathered, the project team will then lead community stakeholders through a qualitative ecosystem services rapid assessment. The assessment will highlight:

- the overall importance of the ecosystem services provided by each of the ecosystems with the focal area,

- the scale of the services (local, regional, global) and who is using them,

- the trends in the ecosystem services—whether they are increasing, decreasing, or stable, and

- the pressures impacting the trends, including climactic and non-climatic pressures.

The results of the rapid ecosystem services assessment will highlight the key ecosystem services that can best address the climate-related societal challenges identified by stakeholders and their associated ecosystems. The services that are assessed as being most at risk, and of highest importance to stakeholders will be prioritized.

The rapid approach does not intend to provide quantitative or monetary values for individual ecosystem services; instead, it is to be used as initial assessment. A detailed biophysical, social or economic assessment should be completed to provide a more quantitative understanding of the ES in the focal area. The more detailed technical assessment chosen will focus on the priority ecosystem services, however it should aim to quantify the key services, focusing on measuring services such as, for example, groundwater recharge rates, temperature regulation, or salinity regulation.

By the end of this step, the project implementation team will have an understanding of the ecosystems present within the site, the services they provide to stakeholders, the status of these services and pressures impacting the ecosystems' ability to provide the services. The team will then be able to begin to identify key ecosystems that provide services tackling the specific climate issues and potential EbA approaches to support the conservation and enhancement of these ecosystems. This information will help to further refine the overall EbA strategy.

For example, historical ecosystem maps may show that the area has previously had expansive wetlands, and further consultations with local stakeholders may reveal that the wetlands hosted healthy fisheries and supported flood regulation. More recent maps may highlight shifts in land use and agricultural encroachment, leading to downstream flooding and a loss of fish nursery areas. Using this information, in later steps the project team could discuss opportunities to restore the most essential areas of the wetland, and work with government agencies and local communities to demarcate the area and provide increased protection. Alternatively, other ecosystem maps may show that the wetland is intact and well connected to the river, allowing it to provide stable and ongoing provisioning and regulating services to the community. In this case, the healthy wetland can be designated as a conservation area to strengthen future protection and ensure the provision of ecosystem services.

Activities

1. Map the ecosystems present within the focal area and conduct a literature review of the ecosystem services provided by the site.

The preliminary ecosystem mapping can use the Land Use maps developed every two years by the Land Development Department of Thailand, which were collected in Step 1 as part of the stocktaking of the basin. Depending on the size of the basin and whether previous mapping work has been done, other map layers may be available (e.g. flood maps, carbon stocks, etc). The project team will also conduct a literature review to understand any documented ecosystem services provided by the site.

2. Conduct a qualitative, rapid ecosystem services assessment during a one-day ecosystem services consultation with communities to understand the services provided to local stakeholders.

During the consultation, the project team will lead community stakeholders in a rapid ecosystem services assessment to map the provisioning, regulating, cultural and supporting services provided by each ecosystem in the focal area.

a. Divide participants by stakeholder group, to ensure that inputs from all participants are documented and that stakeholders have an opportunity to share their thoughts freely amongst their peers. It is important to note that men and women may have different perceptions of the value of particular ecosystem services, therefore it is essential to provide the space for each group to provide inputs. Regulating and supporting services may be more challenging for community members to identify during the exercise, therefore inputs from the project team should also be added.

b. Using one rapid assessment form for each ecosystem in the focal area, request stakeholder inputs on:

1) Ecosystem services provided, and to who
2) Importance of the services
3) Scale of the services
4) Trends in the ability of the ecosystem to provide these services (increasing, stable or decreasing)
5) Climatic and non-climatic pressures impacting the services

c. The assessment should focus on provisioning and regulating services, which are the key ecosystem services supporting climate change adaptation. It is also important to document cultural services to avoid negative impacts on local customary practices, spiritual beliefs, or recreational uses, and supporting services to help identify key co-benefits.

Form 3A: Rapid assessment of ecosystem services and trends

3. Quantitative assessment by project team

a. The project team will lead the review of the ecosystem services assessment and analyse the key services that are facing the highest threats from the climate risks identified in Step 1 and that are most likely playing important roles in climate change adaptation and Disaster Risk Reduction.

b. A quantitative assessment using scientific methodologies and measures should be conducted to confirm the benefits provided by the priority ecosystem services selected. This will serve to verify the stakeholder's perceptions with validated data. Examples of quantitative assessments are provided in the resources section below.

c. Based on the reports, maps and consultation with community members and experts, the project team will identify priority ecosystems and ecosystem services

Outputs

1	Annotated ecosystem map from the Land Development Department, highlighting priority ecosystem services and natural resources, and barriers to the maintenance of ecosystems
2	Documentation on status and trends in ecosystem services provided to local stakeholders, and priority ecosystems and ecosystem services to be restored/managed/conserved identified.

Additional resources

DEFRA. (2011). An introductory guide to valuing ecosystem services. https://www.gov.uk/government/publications/an-introductory-guide-to-valuing-ecosystem-services

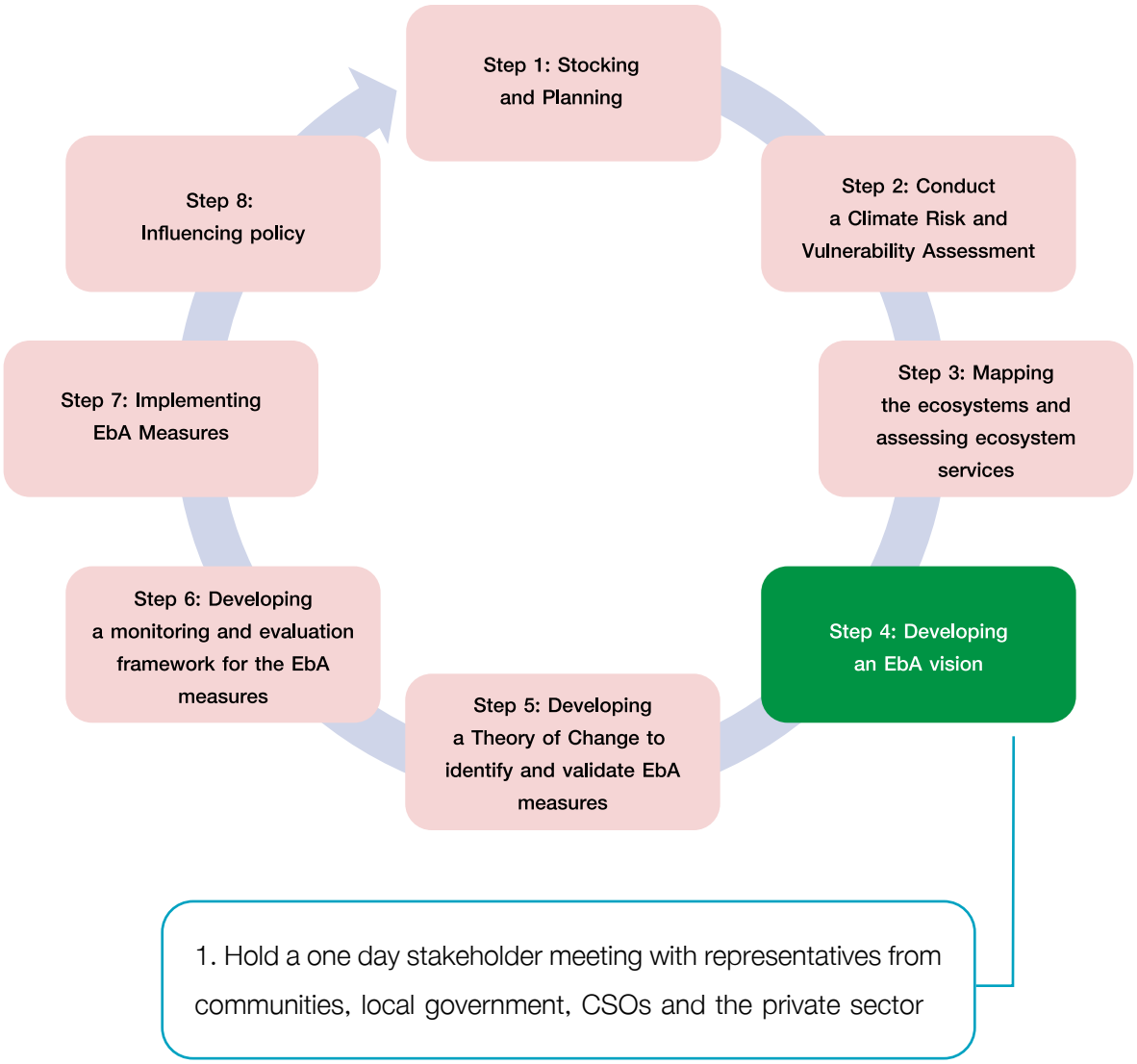
GIZ. Values Navigator http://www.aboutvalues.net/method_navigator/

Neugarten, R.A., Langhammer, P.F., Osipova, E., Bagstad, K.J., Bhagabati, N., Butchart, S.H.M., Dudley, N., Elliott, V., Gerber, L.R., Gutierrez Arrellano, C., Ivanić, K.-Z., Kettunen, M., Mandle, L., Merriman, J.C., Mulligan, M., Peh, K.S.-H., Raudsepp-Hearne, C., Semmens, D.J., Stolton, S., Willcock, S. (2018). Tools for measuring, modelling, and valuing ecosystem services: Guidance for Key Biodiversity Areas, natural World Heritage Sites, and protected areas. Gland, Switzerland: IUCN. x + 70pp. https://portals.iucn.org/library/node/47778

Toolkit for Ecosystem Service Site-Based Assessment (TESSA). http://tessa.tools/

RRC-EA (2020) Rapid Assessment of Wetland Ecosystem Services: A Practitioners' Guide. Ramsar Regional Center – East Asia, Suncheon, Republic of Korea http://rrcea.org/wp-content/uploads/RAWES-Practitioners-Guide-1.pdf

Step 4:
Developing an EbA vision



Objective: **The EbA vision will use the key findings from the Climate Risk and Vulnerability Assessment and the ecosystem services assessment to develop an EbA vision and support the identification of EbA approaches that can support the vision.**

While Steps 1-3 focused on gathering and analysing key information about the project area/ landscape, its vulnerability to climate change and ecosystem services, among other elements, Step 4 is taking the stakeholders through the process of designing a big picture vision for the focal area. This vision will focus on the desired situation in the basin, compared to the climate change threats, and opportunities to manage, conserve and restore ecosystems to tackle these climate threats (the core of the EbA strategy). This is the pivotal step between situation analysis and the design of EbA activities and their implementation.

This step will prepare the ground for more detailed, local level design of EbA measures (Step 5), which will need to be supported by engineers and modellers, under the coordination of the governance mechanism established for the project.

The visioning step is critical as it will ensure that stakeholders have 1) a good understanding of the information gathered to date and what it means for the area and its future in a business as usual case; and 2) find a consensus on what the expectation is for the future, after using EbA approaches.

To be effective, the vision needs to:

- clearly state the ideal situation of the area/ landscape in a defined timeline, against the climate threat identified, i.e. the adaptation impact to be achieved;

- estimate the benefits of this ideal state in terms of human outcomes (who benefits and how) and biodiversity, compared to the business as usual situation;

Following this, the vision should:

- Identify and summarise the potential to manage, conserve and restore ecosystems/ecosystem services (EbA approaches) in the area to address the climate challenges (e.g. the area is very prone to floods and a number of wetlands have been identified which, if restored and reconnected to the mainstream could increase water storage and reduce the frequency and intensity of floods). A list of some key EbA approaches is presented in Table 3 along with the ecosystem services they provide;

- Identify who will benefit from increased resilience and reduced vulnerability;

- Identify or recommend a governance framework and processes which will ensure and maintain inclusiveness in the design, implementation and monitoring process;

- Includes an analysis of potential funding approaches in a concern of triggering long term financial sustainability in the process;

- The vision also includes objectives in term of policy transformation, in order to establish a pathway on how lessons learned will be captured, analysed and feed the policy framework so the space for EbA within policy/planning processes is increased in the future.

To ensure its easy understanding by stakeholders and its replicability to different contexts, the proposed visioning exercise in this Guidebook is kept simple. There is a large diversity of approaches to develop a vision, which will clarify the overall impact that the measures will be working toward, and act as a starting point for a Theory of Change in the design state. This will provide a rationale for the EbA measures, demonstrating how the design needs to be tailored to the desired outcomes and impacts.

The EbA vision will act as a point of reference for programme developers and implementers, by providing a big picture view of the EbA pathway for the area/landscape. The vision also binds all local level technical activities together under the same umbrella, to guide the overall implementation toward the defined goal and to avoid seeing the approach as a series of local level, disconnected activities.

The vision will also enable a clear presentation of the proposed EbA approach to other planners (agriculture, transportation etc.), and can be linked to other relevant visions, such as the vision for the River Basin Master Plan, providing support for discussion on compatibility with other types of planning for the area.

Finally, the vision will form the basis for the development of a Theory of Change for the implementation of EbA in the basin (Step 5).

Activities

1. Hold a one-day stakeholder meeting with representatives from communities, local government, CSOs and the private sector.

Using the guiding questions in **Form 4A**, brainstorm and facilitate a discussion with stakeholders. An example EbA vision for a theoretical basin is presented in Table 2 below. It is essential that facilitators ensure that all groups are engaged in the discussion, making a point to give time for all groups to share ideas and goals. Note takers should document any potential discrepancies or differences in needs of the stakeholder groups, and facilitations should then guide the participants in harmonising the vision, ensuring that all stakeholder goals are represented and not conflicting.

Form 4A: Guiding questions for developing an EbA vision with stakeholders

Form 4B: Example agenda for a one-day consultation on EbA visioning

Table 2 *Example of EbA Vision- Flood Management in Theoretical Basin A*

Component	Current Status (Summary of information from Steps 1-4)	Vision/Expectations for the next 30 years
Climate Vulnerability *Use data from Step 1- Stocktaking and Step 2- Vulnerability Assessment*	Floods are increasing in both frequency and severity in Basin A.	By 2052, communities in Basin A will be less vulnerable to the impacts of flooding.
Societal challenges resulting from climate risk *Use data from Step 1- Stocktaking and Step 2- Vulnerability Assessment*	**Total # of people impacted:** 400 # of people **directly impacted:** 150 # of women: 80 # of men: 70 # of people **directly impacted:** 250 # of women: 150 # of men: 100 The increased frequency and severity of floods is damaging infrastructure and impacting local livelihoods in the basin, particularly agricultural activities.	**Total # of people impacted:** 550 # of people **directly impacted:** 300 # of women: 200 # of men: 100 # of people **directly impacted:** 250 # of women: 150 # of men: 100 A 25% reduction in the frequency and severity of floods will lead to increased food security for 550 residents in the basin and farmer's incomes will increase by 10%.
Biodiversity *Use data from Step 1- Stocktaking (biodiversity assessment), and Step 4- Ecosystem and Ecosystem Services*	The site hosts three endangered species of waterbirds that depend on wetlands for their survival, and whose populations are rapidly decreasing because of a decline in suitable habitat.	Biodiversity assessment shows that the reconnection of oxbows in Basin A, will enhance suitable habitat for endangered waterbirds, and the protection of these sites will lead to a 20% increase in their population.

Table 2 *Example of EbA Vision- Flood Management in Theoretical Basin A*

Component	Current Status (Summary of information from Steps 1-4)	Vision/Expectations for the next 30 years
Developing an EbA approach		
Ecosystem and ecosystem services *Use data from Step 4- Ecosystem Services.*	The six oxbow lakes in Basin A support increased water retention and can reduce the frequency and severity of downstream flooding. They provide habitat for endangered waterbirds and also host Non-Timber Forest Products (NTFPs) that are collected by low-income community members. The disconnection of oxbows is linked to changes in the mainstream water levels due to dredging or straightening of the river.	Modelling (e.g. hydrological and flood modelling) and an ecosystem services assessment in Basin A, demonstrate that reconnecting oxbows will decrease the frequency and severity of downstream flooding and increase the population of endangered birds and NTFPs, resulting in increased biodiversity, and increased incomes for low-income residents who depend on NTFPs.
EbA approach	50% of oxbows in Basin A will be targeted to be reconnected to the mainstream, providing increased water retention and decreasing flooding. This will also increase the available habitat for endangered waterbirds, leading to biodiversity benefits. The selection of the key oxbows for reconnection will be completed in Step 5.	
Governance	The river basin committee will oversee the implementation of reconnection of the oxbows, with strong engagement of community members. A grievance mechanism will be developed in each village where work is being implemented, to allow stakeholders to voice their concerns. The implementation will be led by engineers and direct involvement of community members, which will provide jobs and increase income.	
Funding	Funding for the restoration of the ecosystems will be provided by a combination of national government funding and international, bilateral support. Long lasting funding mechanisms will be developed to ensure the sustainability of the measure.	

Table 2 *Example of EbA Vision- Flood Management in Theoretical Basin A*

Component	Current Status (Summary of information from Steps 1-4)	Vision/Expectations for the next 30 years
Sustainability and mainstreaming	The River Basin Committee will be responsible for documenting the EbA measures in the basin, and ensuring that the lessons learned are shared through meetings with government stakeholders from ONWR and ONEP. The results will shared with other River Basin Committees to further disseminate the learnings and promote upscaling. Best practices will be integrated into a policy brief to be shared with all of the River Basin Committees in Thailand.	

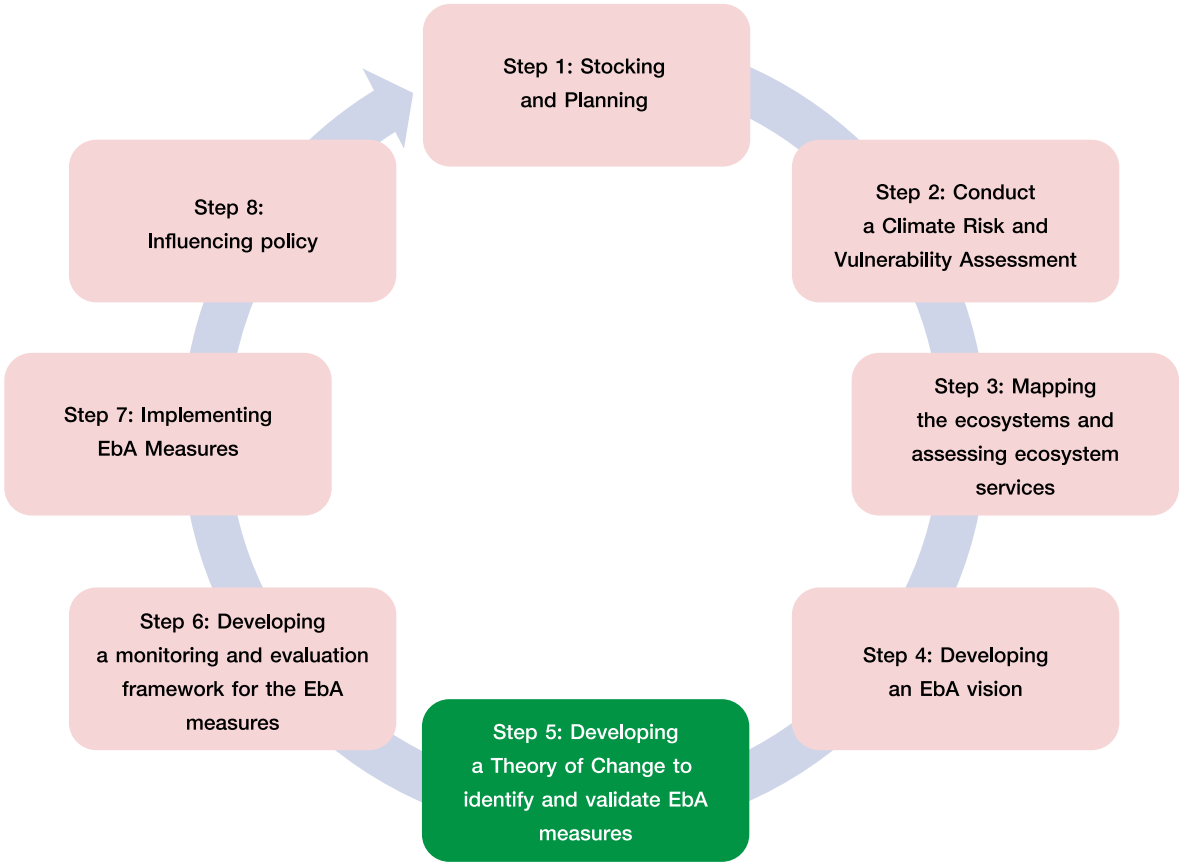
Outputs

1	Validated EbA vision that addresses the main water related climate change vulnerabilities in the focal area

Additional resources:

GIZ, UNEP-WCMC and FEBA (2020) Guidebook for Monitoring and Evaluating Ecosystem-based Adaptation Interventions. Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, Bonn, Germany.

Step 5:
Developing a Theory of Change to identify and validate EbA measures



1. Select the format for the Theory of Change

2 and 3. Review the climate vulnerability assessment, ecosystem services assessment and the vision

4. Use vision to frame the desired impact of the EbA measure

5. Identify and/or describe the EbA measure and the key activities undertaken to implement it and assess their feasibility.

6. Develop a result chain for each activity

7. Add any important risks and assumptions that could affect the EbA measure, the ecosystem and the communities

8. Review safeguard and use the guidance from the IUCN Global Standard on NbS to strengthen the design of the measures

9. Validate EbA measures and the Theory of Change with stakeholders

Objective: This step aims to guide project implementers in identifying, describing and assessing the EbA measures based on the vision and approaches developed in Step 4, and then validating them. The measures selected will aim to reduce climate risks and vulnerabilities and maximise benefits for local stakeholders and biodiversity. This step is structured around the development of a Theory of Change and also references the EbA Code of Practice, which provides detailed instructions on how to design and implement seven pre-selected EbA measures for water in Thailand.

A Theory of Change (ToC) is a tool that is often used to help design projects and activities. It supports the development and design of activities that intend to deliver a particular impact (e.g. an adaptation impact or an EbA vision) and it can also be applied to develop monitoring and evaluation (M&E) frameworks (Step 6). A ToC is a description or illustration of why an activity or measure will be effective, showing how change happens in the short, medium and long term to achieve an intended impact. It can be shown in a visual diagram, or presented as a narrative, or both.

Typically, to develop a ToC, a back-casting approach is used. This means starting with the desired impact and working backwards to define outcomes, outputs and activities. However development of a ToC can be flexible and does not have to follow the sequence of steps strictly. The development of the ToC should help to:

- Ensure the climate change context is well integrated into the design of the activities;
- Clarify the pathways between the EbA measures and the expected impacts;
- Refine EbA measures and associated activities to ensure they are working towards the intended impacts;
- Communicate the project/EbA rationale and M&E approach to partners and stakeholders;
- Refine and prioritise a set of indicators that are most appropriate to measuring the expected impacts (see Step 6).

Making these pathways to impact clear will also help to refine and prioritise a set of indicators that are most appropriate to measuring the expected impacts. The basic steps to develop a ToC are shown in Figure 10. A sample ToC diagram is provided in Figure 11. The Guidebook for Monitoring and Evaluating Ecosystem-based Adaptation Interventions (GIZ, UNEP-WCMC and FEBA 2020) also provides more detailed information and instructions about developing a ToC, with more detailed examples.

EbA measures for river basins should be selected based on an analysis of the context, vulnerabilities in the basin, the sensitivity and capacity of the system to adapt and the priority ecosystems and ecosystem services identified. The project team will use the EbA vision from Step 4 to act as a roadmap for further defining the measures to be implemented. The measures can be selected from a list of potential EbA measures in the Thai water sector (Table 3). These measures are further detailed in Appendix A of the EbA Code of Practice, or alternatively, the project team and engineers may instead choose other measures for implementation. Once the measures are selected, the project team will

develop an initial Theory of Change for how the measures and associated activities will deliver the desired impact, and work with engineers to conduct feasibility studies to ensure that the proposed measures will sufficiently address the vulnerabilities in the focal area, while minimising negative impacts. The team will also determine the most relevant location(s) to implement these measures.

Once the measure have been developed and selected, they will be screened through the eight criteria from the Global Standard on Nature-based Solutions, which will highlight the strengths and weaknesses, and give the project team an opportunity to make adjustments before implementation. The final measures will be validated by stakeholders before being implemented.

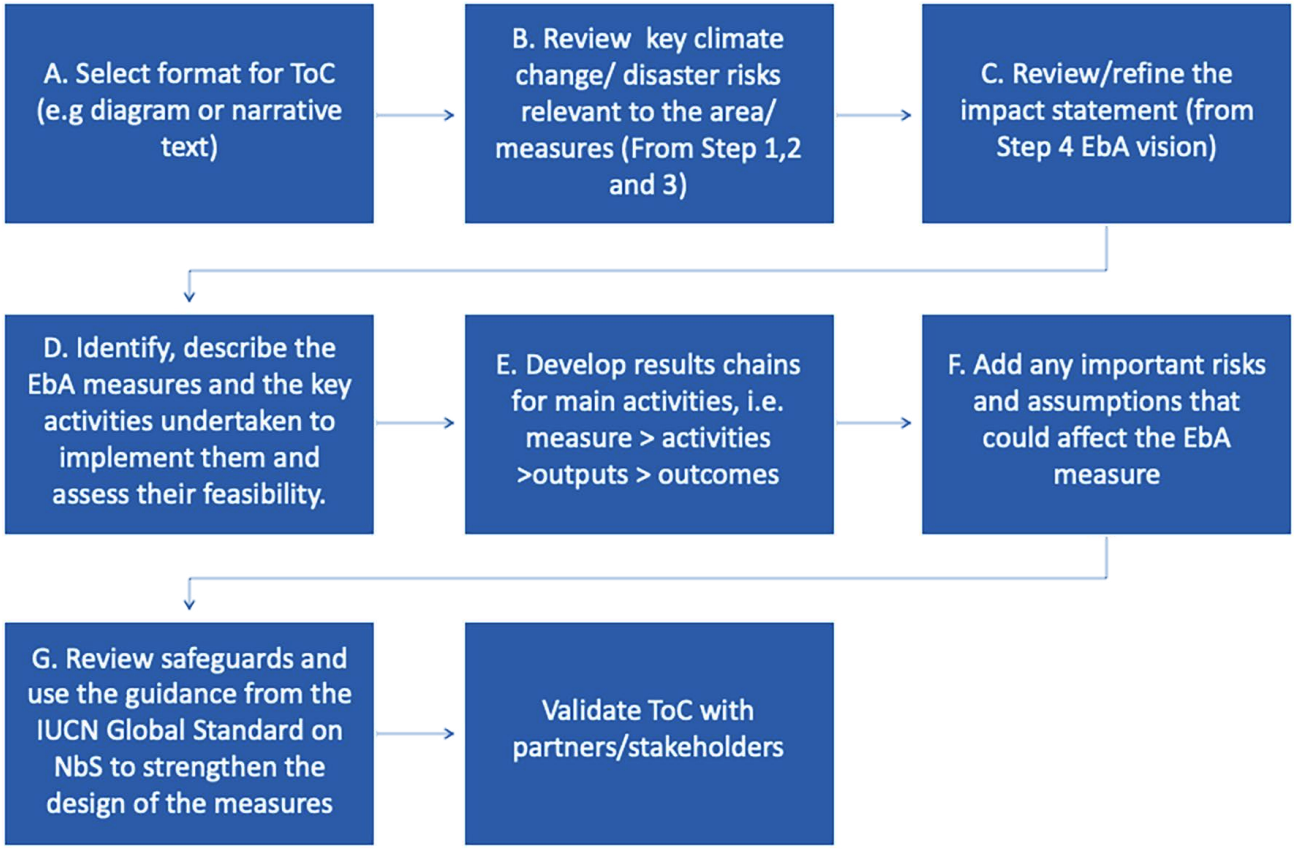


Figure 10 *Step-by-step development of the ToC*

1. Select the format for the Theory of Change

Prepare a format for the ToC diagram or flowchart. For example, the implementation team may wish to prepare the diagram in PowerPoint or another application to make it easy to edit and share. Most ToC diagrams are flow charts, and move from left to right, i.e. starting with measure and corresponding activities on left and working towards impact on right. Backcasting is another approach, where the team works from right to left, starting with the desired impact and identifying what outcomes would create or lead to that impact, then identifying the links to outputs and activities. The team may already have a draft diagram that is being used. A simplified ToC can be seen in Figure 11.

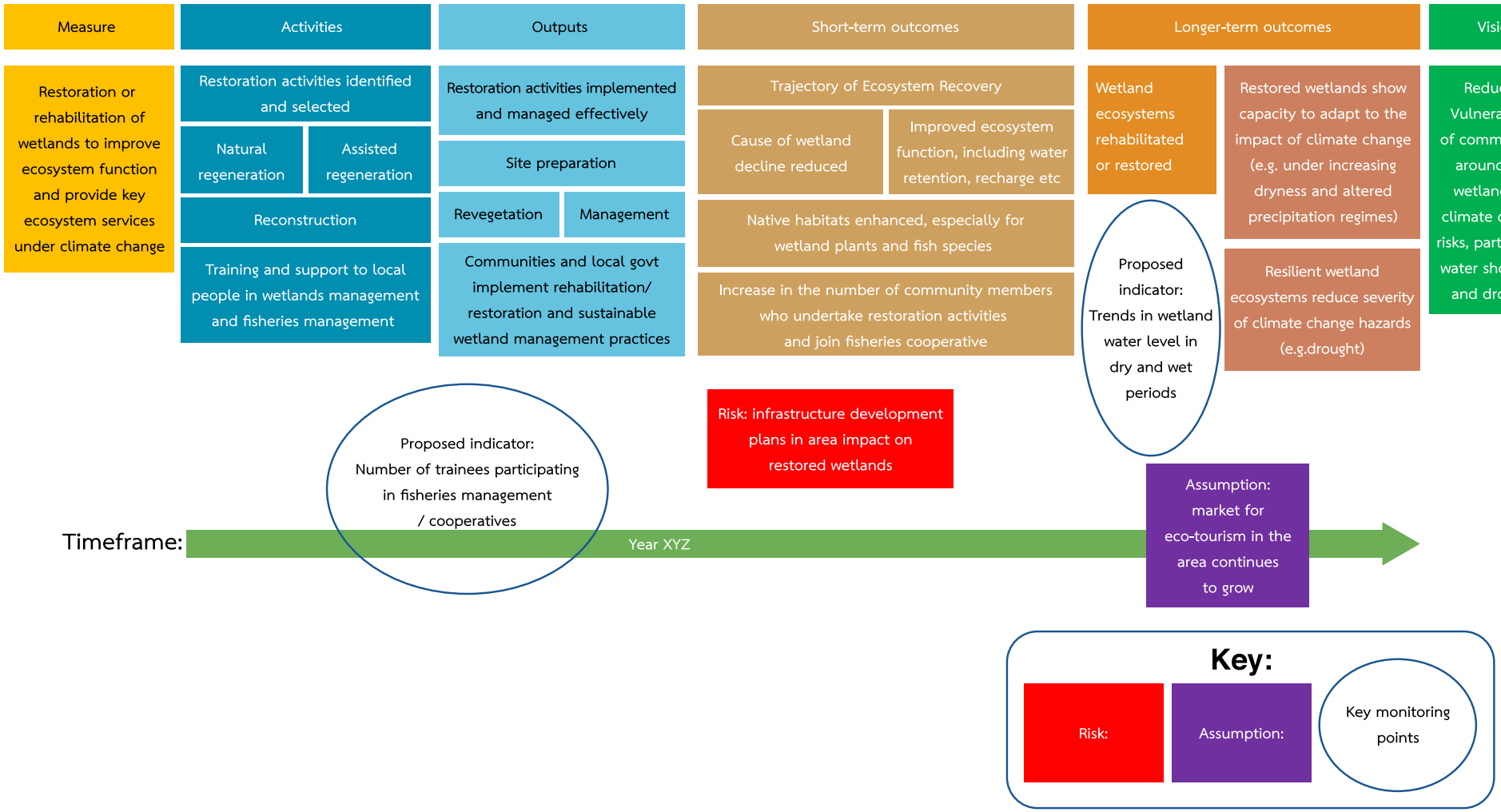


Figure 11 *Example of Theory of Change Diagram on Wetlands Restoration for Climate Adaptation*

2. and 3. Review the climate vulnerability assessment, ecosystem services assessment and the vision

Before identifying EbA measures, it is important that stakeholders review the key results of previous assessments (CRVA, Ecosystem Services assessment) as well as the proposed EbA vision.

It is particularly important that the disaster risks that the EbA measures are supposed to address are clear to stakeholders, that the existing and potential ecosystem services helping tackling the climate risks are well known and that the overall EbA vision is shared, understood and potentially refined.

4. Add or refine the EbA vision and include as the end point of the ToC diagram

The first step in filling in a ToC diagram is to add the EbA vision (i.e. the overall desired impact) of the EbA measures on the far right. This represents the end of the results chain, i.e. the goal that the EbA measures should work towards. Including the vision or desired impact can help the team to check and make sure that their ToC has a strong logic or rationale, i.e. that measures link clearly to activities, outputs, outcomes and finally the EbA vision.

5. Identify, describe the EbA measure and the key activities undertaken to implement it and assess their feasibility.

During this step, the project team will work with engineers to further define the EbA approaches from the vision in Step 4, and determine whether they are appropriate to achieve the intended outcomes, by considering the ecosystem services they address and the ecosystem that they work in.

Examples of potential EbA measures and the ecosystem services they provide are provided in Table 3 **EbA measures (adapted from NWRM 2014)**. The EbA Code of Practice (COP) further describes seven potential EbA measures and associated activities in detail, which have been developed specifically for the Thai river basins, in Table 3, denoted in **bold** with an *. If an additional measure from the table is selected, the exact steps for implementation must be developed with relevant specialists. Additional measures and further details can be found on the European Commission's Natural Water Retention Measures (NWRM)

The EbA interventions do not have to focus solely on water management, however. Interventions to support the achievement of the vision can include working on connected ecosystems to enhance water provision and limit water use, for example, by promoting practices that limit water use in agricultural landscapes. Forest-landscape restoration (FLR) can also be implemented strategically throughout the basin to strengthen climate adaptation and provide biodiversity benefits. If the focal area has an urban centre, green infrastructure and urban design strategies can be applied to reduce flooding, manage heat stress and increase biodiversity benefits. The measures should be summarised using the concept note in Form 5A, and should detail the key activities to be completed by the government, communities and additional stakeholders. The concept note also requires inputs on potential timeframes and budgets to support planning.

Once the potential EbA measures and activities are identified and described, the project team and engineers will complete a feasibility study for each priority EbA measure. These can include, for example, studies on hydrological flow, soil samples, water retention rates, erosion reduction, or other relevant modelling studies depending on the type of measure selected.

The feasibility study will assess the potential outcomes provided by the measures, the technical specifications of the measures and intervention plan, as well as a detailed budget and the stakeholders and responsible government agencies involved.

Modelling the potential hydrological and resulting socio-economic impacts of the measure will help to allocate funding for implementation and promote the measure as a feasible solution to solve the societal challenges identified. There is also a need to analyse the potential application of the measures in terms of the legal context, ensuring that there is compliance with local and national laws when implementing the measure, including conducting an Environmental and Social Impact Assessment and ensuring Free, Prior and Informed Consent (FPIC) from Indigenous Peoples and Local Communities Box 2.

Based on the results, the project team and engineers will conduct a cost-benefit analysis, to understand whether the measure is feasible to implement in the focal area, and whether it is the most cost-effective approach to implement. Other potential analyses can include a multi-criteria analysis to understand more qualitative elements which are more difficult to account for.

Form 5A: Concept Note for Selected EbA Measures

Table 3 EbA measures (adapted from NWRM 2014)

Approach	Description	Key Ecosystem Services								
		Provisioning		Regulating and maintenance					Cultural	
		Water storage/ drought reduction	Fish stock enhancment	Biodiversity preservation	Groundwater aquifer recharge	Flood risk reduction	Erosion/ sediment control	Filtration of pollutants	Recreational opportunities	Aesthetic cultural value
Maintenance of restoration of forest cover in headwater areas*	Forests in headwater areas have a beneficial role for water quantity and quality. Forest soils generally have better infiltration capacity than other land cover types and may act as a "sponge," slowly releasing rainfall. In areas of high relief, afforestation of headwater catchments can contribute to slope stabilization and may reduce the risks associated with landslides. On the other hand, afforestation of headwaters in dry areas may lead to reduction of downstream water yield.									
Buffer strips and hedges*	Buffer strips are areas of natural vegetation cover (grass, bushes or trees) at the margin of fields, arable land, transport infrastructures and water courses. Due to their permanent vegetation, buffer strips offer good conditions for effective water infiltration and slowing surface flow; they therefore promote the natural retention of water. They can also significantly reduce the amount of suspended solids, nitrates and phosphates originating from agricultural run-off. Buffer strips can be sited in riparian zones, or away from water bodies as field margins, headlands or within fields.									

Table 3 EbA measures (adapted from NWRM 2014)

Approach	Description	Key Ecosystem Services								
		Provisioning		Regulating and maintenance					Cultural	
		Water storage/ drought reduction	Fish stock enhancment	Biodiversity preservation	Groundwater aquifer recharge	Flood risk reduction	Erosion/ sediment control	Filtration of pollutants	Recreational opportunities	Aesthetic cultural value
Forest riparian buffers*	By preserving a relatively undisturbed area adjacent to open water, riparian buffers can serve a number of functions related to water quality and flow moderation. The trees in riparian areas can efficiently take up excess nutrients and may also serve to increase infiltration. Riparian buffers serve to slow water as it moves off the land. This can decrease sediment inputs to surface waters. Riparian buffers also provide shade which helps to sustain lower water temperatures.									
Basin and ponds (Monkey cheeks)*	The creation and maintenance of basins and ponds will enable a better water storage in the watershed, provide support to groundwater infiltration, support siltation management and potential enhancement of biodiversity.									

*** Indicates the measure is detailed in the Code of Practice**

Legend: Qualitative Scale High Medium Low None

Table 3 EbA measures (adapted from NWRM 2014)

Approach	Description	Key Ecosystem Services								
		Provisioning		Regulating and maintenance					Cultural	
		Water storage/ drought reduction	Fish stock enhancment	Biodiversity preservation	Groundwater aquifer recharge	Flood risk reduction	Erosion/ sediment control	Filtration of pollutants	Recreational opportunities	Aesthetic cultural value
Reconnection of oxbow lakes and similar features*	Reconnecting oxbows with the river consists in removing terrestrial lands between both water bodies, therefore favouring the overall functioning of the river by restoring lateral connectivity, diversifying flows and cleaning the river section of the present oxbow for better water retention during floods and increased water storage during the dry season.									
Natural bank stabilisation*	In the past, numerous artificial banks or other types of retention walls were built with concrete, limiting rivers' natural movements, leading to degradation of the river, increased water flow, increased erosion and decreased biodiversity. River bank renaturalisation consists in recovering its ecological components, thus reversing such damages and especially allowing bank to be stabilized, as well as rivers to move more freely. Nature-based Solutions such as green infrastructure are preferable.									

Table 3 EbA measures (adapted from NWRM 2014)

Approach	Description	Key Ecosystem Services								
		Provisioning		Regulating and maintenance					Cultural	
		Water storage/ drought reduction	Fish stock enhancment	Biodiversity preservation	Groundwater aquifer recharge	Flood risk reduction	Erosion/ sediment control	Filtration of pollutants	Recreational opportunities	Aesthetic cultural value
Mangrove restoration, conservation and management*	Mangroves act as natural coastal barriers that reduce the height and energy of waves, protecting coastal communities and reducing erosion by securing sediments. The root structures of mangroves are essential nursery grounds for fish and other marine organisms, supporting both biodiversity and fisheries. Mangrove restoration involves regenerating mangrove forests in areas where they previously existed, to restore the ecosystem services provided. The conservation and proper management of mangrove ecosystems is also an important NbS.									
Restoration and management of coastal wetlands*	Coastal wetlands including mangroves, seagrass beds, coral reefs and mudflats, provide essential habitat to juvenile fish and other marine organisms. These habitats also help in mitigating the impacts of storms, and are key habitats for blue carbon storage. Restoring seagrass beds, coral reefs, mudflats and mangroves can include planting new seagrass, propagating coral fragments or mangroves, or protecting these habitats to allow for natural regeneration. The removal of embankments and other hard infrastructure can also foster the restoration of mudflats and other coastal wetlands.									

*** Indicates the measure is detailed in the Code of Practice**

Legend: Qualitative Scale High Medium Low None

Table 3 EbA measures (adapted from NWRM 2014)

Approach	Description	Key Ecosystem Services								
		Provisioning		Regulating and maintenance					Cultural	
		Water storage/ drought reduction	Fish stock enhancment	Biodiversity preservation	Groundwater aquifer recharge	Flood risk reduction	Erosion/ sediment control	Filtration of pollutants	Recreational opportunities	Aesthetic cultural value
Wetlands restoration and management	Wetlands provide water retention, biodiversity enhancement or water quality improvement. Wetland restoration and management can involve: technical, spatially large-scale measures (including the installation of ditches for rewetting or the cutback of dykes to enable flooding); technical small-scale measures such as clearing trees; changes in land-use and agricultural measures, such as adapting cultivation practices in wetland areas. The degradation of these ecosystems, particularly peatlands can cause increased emissions, emphasising the importance of managing and conserving them.									
Floodplain restoration and management	Restoring the floodplain roles requires measures such as modification of the channel, removing of the legacy sediment, creation of lakes or ponds in the floodplain, new/modification of agricultural practices, afforestation, wetland creation, invasive species removal and riparian buffer installation and natural riparian buffer installation and development.									

Table 3 EbA measures (adapted from NWRM 2014)

Approach	Description	Key Ecosystem Services								
		Provisioning		Regulating and maintenance					Cultural	
		Water storage/ drought reduction	Fish stock enhancment	Biodiversity preservation	Groundwater aquifer recharge	Flood risk reduction	Erosion/ sediment control	Filtration of pollutants	Recreational opportunities	Aesthetic cultural value
Re-meandering	River re-meandering consists in creating a new meandering course or reconnecting cut-off meanders, therefore slowing down the river flow. The new form of the river channel creates new flow conditions and very often also has a positive impact on sedimentation and biodiversity.									
Restoration and reconnection of seasonal streams	Restoring and reconnecting seasonal streams with the river consists in favouring the overall functioning of the river by restoring lateral connectivity, diversifying flows and ensuring the proper functioning of these seasonal streams for better water retention during floods.									

*** Indicates the measure is detailed in the Code of Practice**

Legend: Qualitative Scale High Medium Low None

Table 3 EbA measures (adapted from NWRM 2014)

Approach	Description	Key Ecosystem Services								
		Provisioning		Regulating and maintenance					Cultural	
		Water storage/ drought reduction	Fish stock enhancment	Biodiversity preservation	Groundwater aquifer recharge	Flood risk reduction	Erosion/ sediment control	Filtration of pollutants	Recreational opportunities	Aesthetic cultural value
Riverbed material renaturalisation	Riverbed material re-naturalization consists in recovering the natural structure and composition of the bed load, in particular the equilibrium between coarse and fine sediment. In case of deficit of coarse sediment leading to river incision, the main objective is to level-up the riverbed with this type of sediment, strategically reactivating bank erosion in terrains contributing to this type of sediment.									
Removal of dams and other longitudinal barriers	Removing longitudinal barriers consists in destroying all the obstacles, restoring the slope and the longitudinal profile of the river, therefore allowing re-establishment of fluvial dynamics, as well as sedimentary and ecological continuity.									

Table 3 EbA measures (adapted from NWRM 2014)

Approach	Description	Key Ecosystem Services								
		Provisioning		Regulating and maintenance					Cultural	
		Water storage/ drought reduction	Fish stock enhancment	Biodiversity preservation	Groundwater aquifer recharge	Flood risk reduction	Erosion/ sediment control	Filtration of pollutants	Recreational opportunities	Aesthetic cultural value
Elimination of riverbank protection	Eliminating river bank protection consists in removing some parts of the bank protection in order to enhance lateral connections of the river, diversify flows (depth, substrate, and speed) and habitats, but also to cap floods in the mainstream. It is a prerequisite for many other measures like re-meandering or widening, as well as initiating later channel migration and dynamics.									
Lake restoration	In the past, lakes have sometimes been drained to free the land for agriculture purposes, or have simply not been maintained and have silted up. Restoring lakes consists in enhancing their structure and functioning where they have been drained in former times.									

*** Indicates the measure is detailed in the Code of Practice**

Legend: Qualitative Scale High Medium Low None

Table 3 EbA measures (adapted from NWRM 2014)

Approach	Description	Key Ecosystem Services								
		Provisioning		Regulating and maintenance					Cultural	
		Water storage/ drought reduction	Fish stock enhancment	Biodiversity preservation	Groundwater aquifer recharge	Flood risk reduction	Erosion/ sediment control	Filtration of pollutants	Recreational opportunities	Aesthetic cultural value
Meadows and pastures	Meadows and pastures provide good conditions for the uptake and storage of water during temporary floods. They also protect water quality by trapping sediments and assimilating nutrients. The measure offers the potential for temporary flood storage, increased water retention in the landscape and runoff attenuation. Soil cover is maintained at all times with rooted vegetation, this reduces the surface flow of water and allows greater infiltration to the soil.									

*** Indicates the measure is detailed in the Code of Practice**

Legend: Qualitative Scale High Medium Low None

6. Develop a result chain for each activity

Once the main/key activities have been identified and assessed, develop a **results chain** for each of these (see example in Figure 11) - noting that it is best to prioritise/select activities that are directly associated with the measure. Because an EbA measure is actually made up of sub-activities or components, these sub-activities may affect different aspects of risk and longer-term resilience. For example, as part of the measure, or linked to it, the government may release fish into the site, to support local fisheries. If we include this as a sub-activity, we can better capture the potential co-benefit of linking the measure with fisheries support.

The result chain should include a summary of the information captured in Form 5A for each measure/activity:

- o short description of the activity (*e.g. capacity building on weir construction for local community*);
- o the major outputs of the activity (*e.g. manual developed; training course provided; 30 people trained; weir constructed; fisheries management plan produced*);
- o the expected immediate outcomes of the activity (*e.g. improved M&E capacity of community; reduced soil run-off into the river, etc*); and
- o the expected long-term outcomes, i.e. those that will ultimately lead to the overall impact of the measure and the EbA vision (*e.g. reduced soil run-off improves water quality, contributing to ecosystem resilience; improved fish habitat provides a co-benefit for biodiversity as well as for productivity of fisheries that support the community*).

Form 5B: TOC and result chain template/ guidance

7. Add any important risks and assumptions that could affect the EbA measure

Next, add any **important risks / assumptions** that may influence the expected impacts of the measure and the M&E framework to the diagram. For example:

- o Assumption: flood / drought is likely to increase in frequency / severity in the sites
- o Assumption: government will continue to implement measures to support fisheries
- o Risk: communities will shift to concrete infrastructure as soon as funds are available
- o Risk: invasive plant species will affect the operation of the measure

8. Review safeguard and use the guidance from the IUCN Global Standard on NbS to strengthen the design of the measures

Following this, the project team will develop a review to ensure that the proposed measures are in accordance with some commonly accepted safeguards for EbA (Box 2) and screen the set of proposed measures through the IUCN Global Standard for NbS, in order to ensure the overall intervention meets all ecological, economic criteria but also, and importantly social criteria (Box 1).

The guiding questions in Form 5C aim to provide the project team with an opportunity to familiarize themselves with the Global Standard and begin the process of assessing the measures against the eight NbS criteria. The results will highlight the strengths of the measure, and also the space for improving each measure to make it adhere to the Standard. The questions will re-validate some of the elements outlined in previous steps, but will also highlight the need to address additional criteria for NbS, including governance, trade off and economic feasibility.

Form 5C: NbS Criteria Assessment

9. Validating EbA measures and ToC with stakeholders

The project lead will then use the data to finalise detailed concept notes for each measure, to inform the step-by-step implementation process. The concept note will highlight the measure, define the intervention area, identify key individuals and responsible agencies to engage in the implementation, develop a timeline for implementation, identify beneficiaries and state the costs associated with each measure.

The project will organize a consultation with stakeholders to review the final measures, feasibility and associated outcomes. Participants will rank measures and identify the most cost beneficial and aligned with the IUCN Global Standard for NbS. The set of measures to move to implementation stage will then depend on budget availability.

The consultation will provide an opportunity for the main beneficiaries of the measures to share their thoughts on the detailed measures developed, and provide feedback. This is also an opportunity to develop a grievance mechanism for each intervention, and to make all stakeholders aware of the mechanism and how to use it. The recommendations from the consultation should be integrated into the concept notes and implementation plan for each measure.

Outputs

1	Final concept note(s) for EbA measure(s)
2	Theory of Change for EbA measures and activities

Additional resources:

EbA Code of Practice- https://ebook.onwr.go.th/category/stored/197

European Commission. Natural Water Retention Measures. http://nwrm.eu/measures-catalogue

GIZ (2013). Economic approaches for assessing climate change adaptation options under uncertainty Excel tools for Cost-Benefit and Multi-Criteria Analysis. Eschborn. 27 pp. https://www.adaptationcommunity.net/download/ms/mainstreaming-guides-manuals-reports/Economic_assessment_of_CC_adaptation_options_-_GIZ_2013.pdf

GIZ, UNEP-WCMC and FEBA (2020) Guidebook for Monitoring and Evaluating Ecosystem-based Adaptation Interventions. Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, Bonn, Germany.

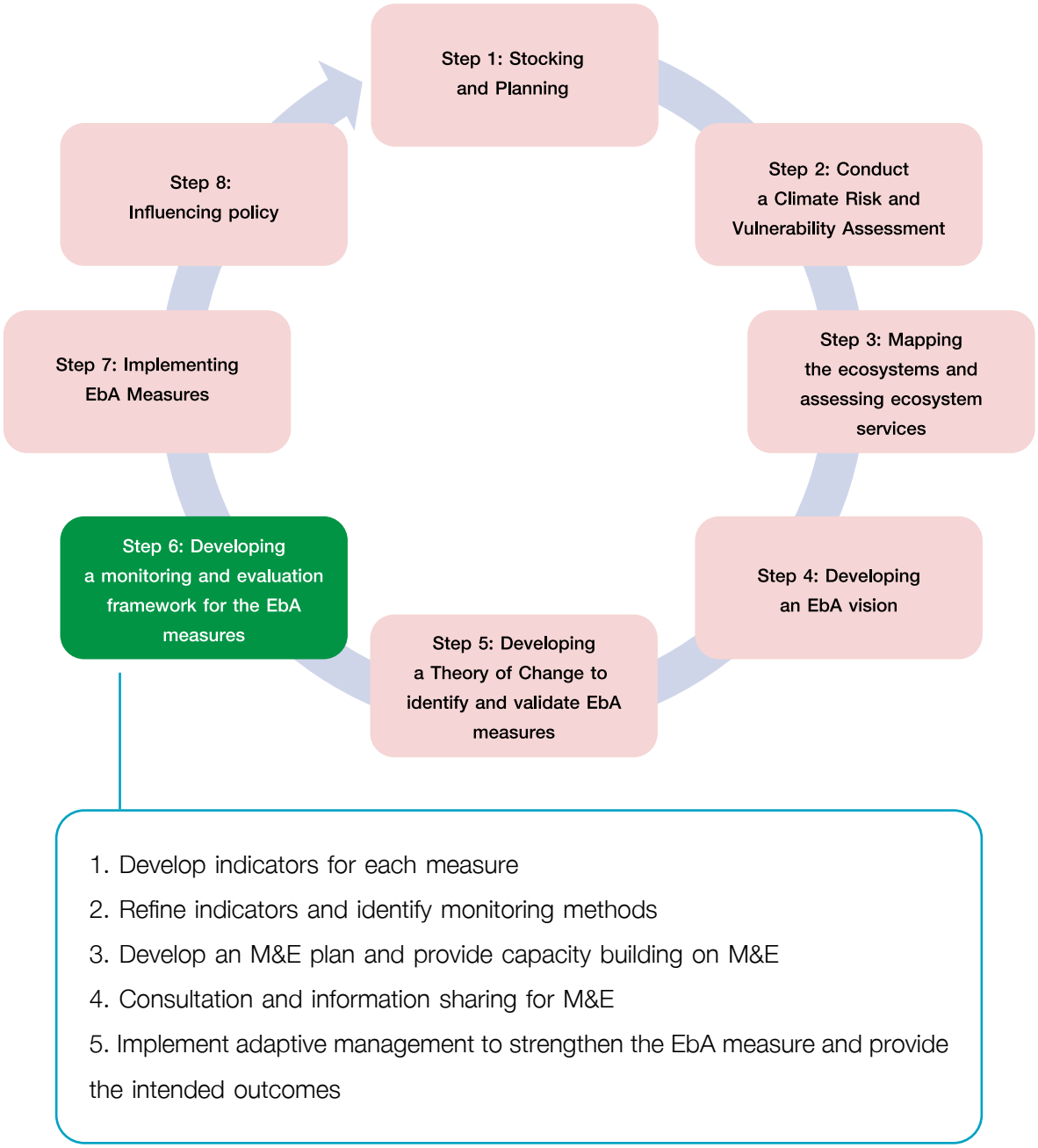
IUCN (2020). Guidance for using the IUCN Global Standard for Nature-based Solutions. A user-friendly framework for the verification, design and scaling up of Nature-based Solutions. First edition. Gland, Switzerland: IUCN. https://portals.iucn.org/library/sites/library/files/documents/2020-021-En.pdf

IUCN and WRI (2014). A Guide to the Restoration Opportunities Assessment Methodology (ROAM): Assessing forest landscape restoration opportunities at the national or sub-national level. Working Paper (Road-test edition). Gland, Switzerland: IUCN. 125p.

Ramsar Secretariat (2010). *River basin management: Integrating wetland conservation and wise use into river basin management*. Ramsar handbooks for the wise use of wetlands, 4th edition, vol. 9. Ramsar Convention Secretariat, Gland, Switzerland.

United Nations Framework Convention on Climate Change (UNFCCC) (2011). Assessing the Costs and Benefits of Adaptation Options: An Overview of Approaches. Nairobi. 52 pp. https://unfccc.int/resource/docs/publications/pub_nwp_costs_benefits_adaptation.pdf

Step 6:
Developing a monitoring and evaluation framework



Objective: This step aims to develop a framework to help understand the change that the selected EbA measures have had on the communities and ecosystems, to gauge their effectiveness, and whether or not and why EbA measures are having the desired effect. Monitoring and evaluation (M&E) is part of an ongoing process, and measures should be continuously evaluated throughout their lifetime, and adjusted as needed as the ecosystem or socio-economic conditions in the area change.

In this step, the project team and stakeholders will develop an M&E framework with indicators to help in assessing the efficacy of the EbA solution in addressing the climate risks identified. The proposed indicators from the Theory of Change, developed in Step 5 will be further refined and linked to the outcomes identified in the results chains.

Why is M&E for EbA important?

Monitoring and evaluation (M&E) of EbA measures is essential for decision-makers and stakeholders to understand whether the intervention effectively delivers the intended outcomes. During monitoring, the project team will routinely collect/compile data to measure changes in the focal area compared to the baseline status. This data will then be analysed and evaluated to help gauge the changes resulting from the implementation of the EbA measure, which can be either positive or negative.

M&E provides crucial insight for assessing whether or not an EbA measure (or suite of measures) is achieving the outcomes that it was designed for. This is essential for the local stakeholders, who are directly impacted by the EbA measures, but it is also key for scaling-up EbA at a global scale. Collecting case studies and related data on the outcomes of EbA measures can help build momentum for further promoting the benefits of EbA for water management, and scaling-up its implementation to benefit additional stakeholders.

In addition, M&E can help project implementers detect if something is not going as originally planned, requiring the measure to be adjusted to improve its effectiveness, or minimise negative impacts. This process is known as adaptive management, and is essential for EbA measures because they are being implemented in a rapidly changing climate and a dynamic environment, with socio-economic and socio-political factors that are also in flux. To ensure that the measures continue to address the societal challenges that they were designed for, they must be monitored, evaluated and adjusted as needed, throughout their lifespans. If EbA solutions are found to have any negative impacts, they must be adjusted to reduce the unforeseen negative impacts. The process of adaptive management should continue throughout the lifecycle of the intervention, ensuring that the EbA measure is able to continue providing the benefits that it was originally designed for.

Linked to this, M&E can also encompass monitoring of risk factors, risk mitigation measures and safeguards issues. For example, the project team will likely want to monitor whether stakeholders are participating in EbA, whether any risks to the environment or community are occurring, and whether mitigation measures – such as, to reduce the risk of invasive species or loss of income to communities – are being properly implemented.

Activities

1. Develop and refine indicators for each measure

The TOC developed in Step 5 should provide detail on the expected outputs, outcomes and impacts – including potential risks, trade-offs and co-benefits – that should be monitored. Referring to the TOC, the team will develop a list of indicators for each EbA measure described (see Form 5A) and for the overall impact, to support monitoring and evaluation.

Indicators should be SMART (Specific, Measurable, Attainable, Relevant and Time-bound) and serve as a tool to assess whether the EbA measure is achieving its intended goal. Indicators should cover key aspects of the results chains identified for each EbA measure, for example: what activities need to be implemented; what outputs need to be delivered; what immediate and intermediate outcomes are expected; what risks/ trade-offs and co-benefits need to be understood; and how do the outcomes contribute to the overall impact from EbA.

After developing a long-list of indicators, the project team should consult with local community leaders and authorities as part of a process to refine the indicators.

It is recommended that the team develop an indicator table that can be used to set out all of the indicators, and to identify for each what methods and data sources will be used, frequency of data collection, etc. This process should highlight whether there are any indicators that are duplicated/ overlapping, and whether any will not be practical or feasible to monitor, e.g. due to difficult methods or lack of data. At this stage, the project team should also consider any options to use participatory M&E methods (e.g. involving communities or other stakeholders in data collection, analysis and evaluation) and ways to link up or streamline the M&E process with other relevant monitoring in the area.

By design, M&E is a long-term, ongoing process. Often its sustainability can be overlooked in project design and timelines, therefore it is essential to identify opportunities to sustain M&E, such as ensuring that local stakeholders, who live near the focal area, are involved in the M&E process, or making links to other M&E processes (e.g. by local authorities and River Basin Committees). Engaging local stakeholders in M&E has two benefits: first, it documents and highlights the benefits of the EbA measure, and second it can provide an opportunity to continue to involve them in the EbA process, further building a sense of ownership and allowing M&E to extend beyond the duration of the project. Community members should be directly involved in decision-making regarding adaptive management and the brainstorming of the alternations needed to strengthen the EbA measure.

Box 6 Indicators related to reconnecting oxbow lakes to the river

Output indicator:

- o Number of oxbows fully or partially reconnected to the river system
- o Number of people (men, women) employed in oxbow reconnection works
- o Number of local government officials trained in IWRM

Immediate outcome indicator:

- o Trends in surface water level downstream of oxbows, before and after reconnection
- o Trends in river flow rate, before and after reconnection

Intermediate outcome indicator:

- o Modelled flood risk after reconnection
- o Income from fisheries among river basin households, before and after reconnection
- o Trends in population of endangered bird species

Co-benefit / trade-off indicator:

- o Level of engagement (number of person -days) in river basin committee activities for key stakeholder groups (potential governance co-benefit)
- o Trends in population for species preferring standing water in oxbow lakes (potential biodiversity trade-off)

Form 6A: Indicator table

2. Develop an M&E plan and provide capacity building on M&E

In addition to defining the indicators and methods, the project team should prepare an M&E plan: this can be a short document which sets out how the M&E will be carried out, including aspects such as:

- The objectives of the M&E approach
- Who will coordinate and who will be involved in the M&E
- Any training, capacity building and equipment needed for the M&E
- Key milestones, e.g. if the project will involve any mid-term and final evaluations, consultation workshops, etc
- The collection of baseline data (against the indicators), and frequency of data collection
- Any key studies / processes to support M&E, such as stakeholder/household surveying, any specific baseline or follow up studies that link to M&E (e.g. biodiversity surveys, hydrology studies, economic valuation)
- How the M&E information will be communicated and shared with stakeholders
- Any plans/processes for adaptive management (e.g. review and adjustment of project activities based on M&E results)
- Budget allocated for M&E

As noted above, the M&E plan should include any capacity needs and planned capacity building, training and equipment to support M&E. This may include capacity building for the project team, but ideally will also cover capacity building for community members, local government or other stakeholders who will participate in M&E.

3. Consultation and information sharing for M&E

The M&E plan should include opportunities for consultation and stakeholder feedback, and set out how you plan to communicate and share the results of M&E. This should take into account any review/ evaluation processes that are required for the EbA measures or project (e.g. mid-term / final evaluations). It should also take into account the most appropriate channels for communication with local stakeholders, including the use of local languages. It is recommended that the team organises a consultation with community and government stakeholders at six months, 12 months, 18 months, 24 months, and then annually, for up to five years following the implementation of the measures, to understand how the EbA solution is functioning in regards to addressing identified climate risks. The consultations will provide insight into the general perception of stakeholders as to the effectiveness of the measure, and help to assess progress on the indicators developed in Steps 4 and 5. During the consultations, the results or information collected against the indicators for each measure should be assessed, followed by assessing the overall progress against the desired impact of the EbA measures and the EbA vision, to understand the overall achievement of the vision. Recommendations for future adaptive management or improvements to the EbA measures should also be discussed. Building upon the feedback from the stakeholder consultation and any additional evaluations, document changes to be made to the intervention to ensure that negative impacts are reduced and positive benefits are optimised.

In addition to consulting with local communities and stakeholders, the project team may also want to package and share information on the EbA results at different levels, such as communicating the impacts and benefits of EbA with policy makers. M&E can provide crucial data on EbA measures to feed into relevant policy processes (see Step 8).

4. Implement adaptive management to strengthen the EbA measure and provide the intended outcomes

As mentioned above, a key purpose of M&E for EbA is to support adaptive management: M&E can help to detect if something is not going as originally planned, and why, requiring the measure to be adjusted to improve its effectiveness, or minimise negative impacts. Adaptive management is also about taking advantage of opportunities and ways to improve the positive impacts of the measures.

Figure 12 *Adaptive management process*

In order to translate M&E results into adaptive management, it is useful to explicitly require regular evaluation or review processes that consider what changes may be needed to increase positive impacts and reduce any negative impacts. Options to support adaptive management include:

- Making sure that the steps or processes for adaptive management are specifically included in your M&E plan;
- Including recommendations for adaptive management in any terms of reference (ToR) for evaluations or reviews of the measures
- Ensuring that any consultation processes for review of the EbA measures include discussion of steps to improve the measures / adaptive management

Form 6B: Summary table for review and adaptive management

Outputs

1	Indicator table including methods
2	M&E plan

Additional resources:

BetterEvaluation (2012): Communicating evaluation findings

CARE (2012): Participatory monitoring, evaluation, reflection and learning for community-based Adaptation

CB (2011) Developing ecosystem service indicators

CI (2013) Constructing theories of change models for ecosystem-based adaptation projects: a guidance document

Dickson et al. (2017) PRISM: Toolkit for evaluating the outcomes and impacts of small/medium-sized conservation projects

FEBA (2017) Making ecosystem-based Adaptation effective: A framework for defining qualification criteria and quality standards

GIZ (2016) MACC-Tool: Monitoring Climate Adaptation Projects

GIZ and IISD (2014) Repository of adaptation indicators: Real case examples from national monitoring and evaluation systems

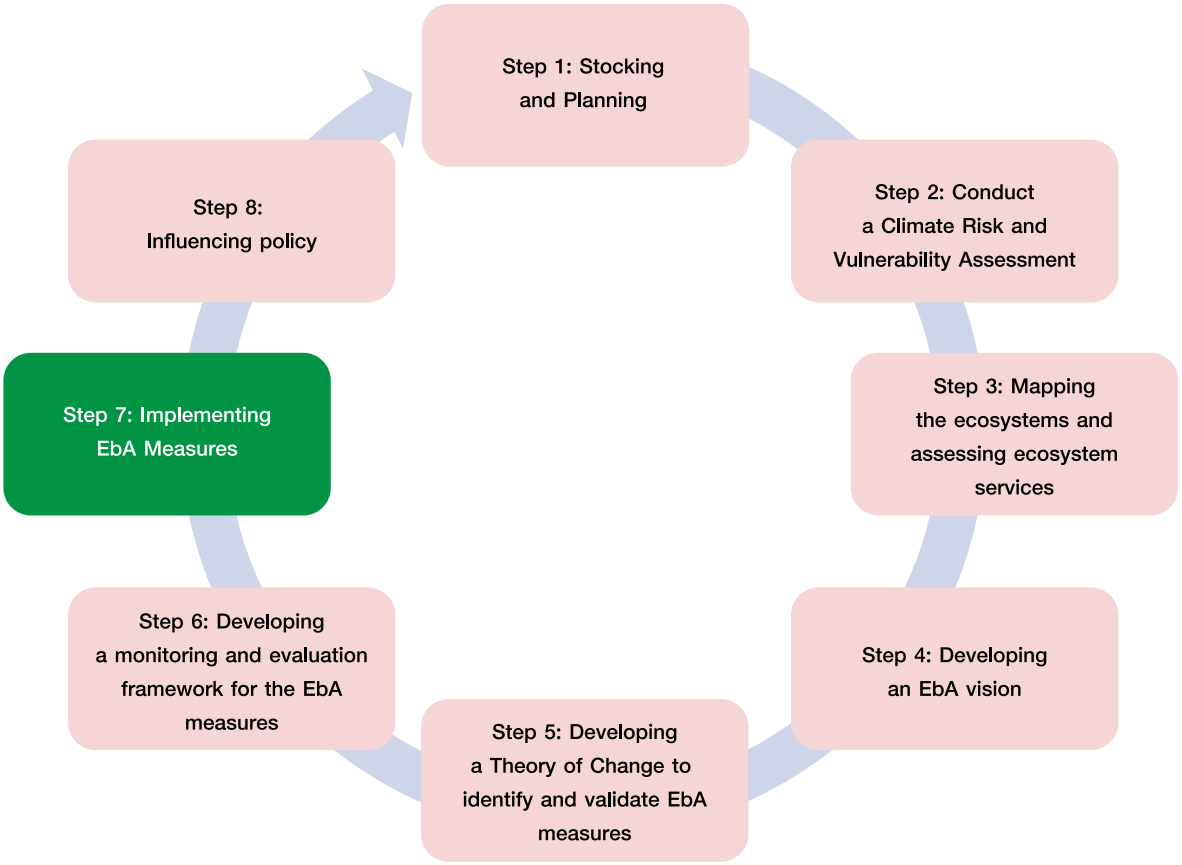
GIZ, UNDP and Ceval (2015): Impact evaluation guidebook for climate change adaptation projects

GIZ, UNEP-WCMC and FEBA (2020) Guidebook for Monitoring and Evaluating Ecosystem-based Adaptation Interventions. Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, Bonn, Germany.

IIED, IUCN and UNEP-WCMC (2017) Ecosystem-based Adaptation: Question-based guidance for assessing effectiveness

SEA Change and UK Climate Impacts Programme (UKCIP) (2014) Monitoring & Evaluation for Climate Change Adaptation and Resilience: A Synthesis of Tools, Frameworks and Approaches

Step 7:
Implementing EbA Measures



Objective: Work with local stakeholders to implement the identified EbA measures in the focal area.

Following the development of the indicators and M&E plan, the engineers will lead the development of a step-by-step implementation approach for each measure, including a comprehensive cost projection.

The measures will be implemented at the site following safeguards (Box 2) and best practices for directly engaging local communities in implementation, to promote ownership at the local level, while ensuring that there are ecosystem experts and engineers leading the more technical components. Where possible, lower income community members, especially women, should be employed to support implementation. This may be more feasible for some measures, such as reforestation, and less feasible for other measures, such as reconnecting oxbows, which will require heavy machinery and engineering solutions such as mechanical sluice gates, that community members may not be familiar with operating or constructing. It is also important to note that when restoring vegetation in a focal area, only native species should be used, to prevent unforeseen impacts from the introduction of invasive species.

Implementing the EbA measures

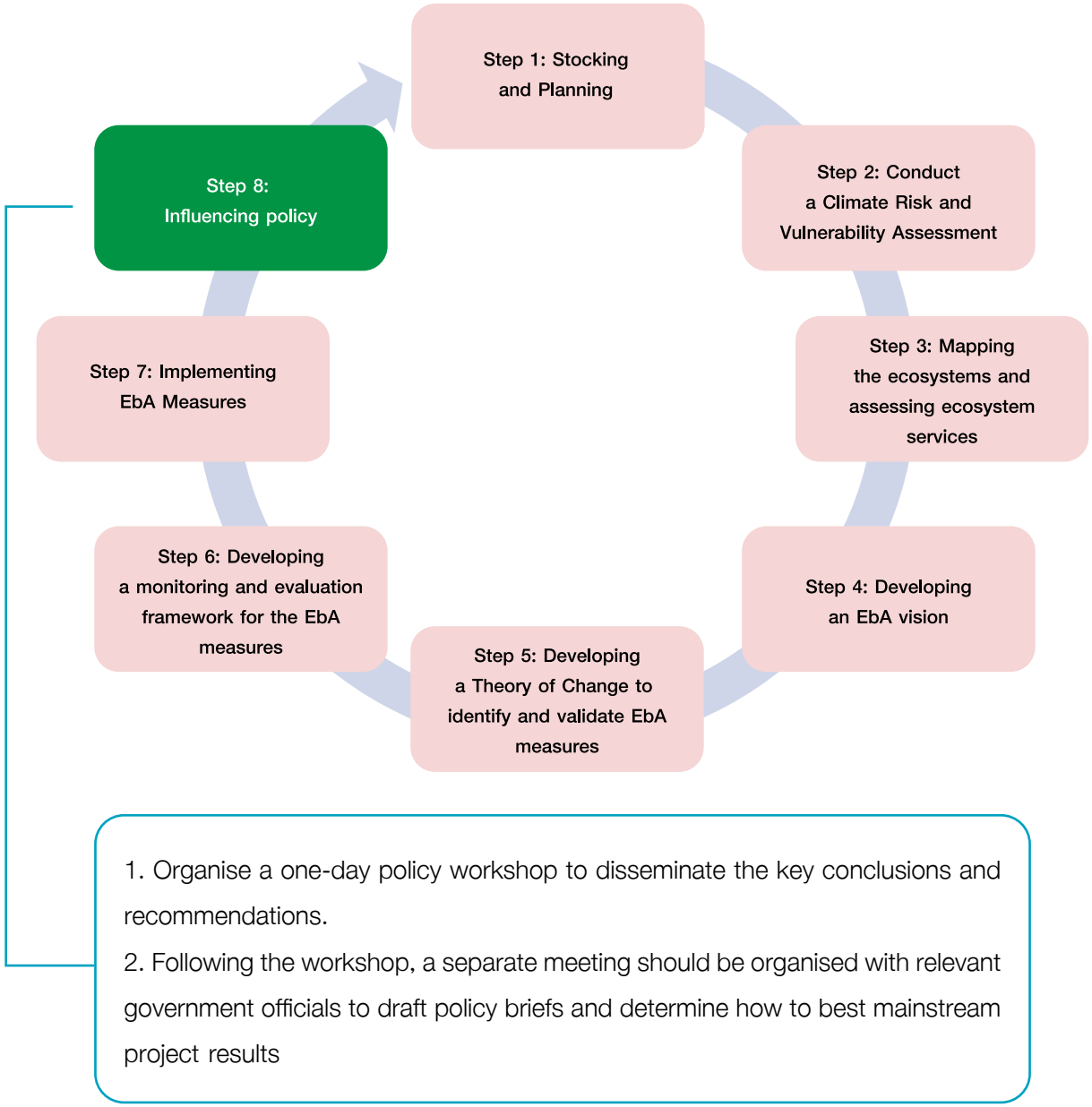
The implementation process of EbA measures will vary based on the measures selected. Generally, however, there is a need to define the roles and responsibilities of all stakeholders during the implementation process and further detail the skills needed based on the actual measures to be implemented. The capacity needs assessment conducted in Step 1 can be revised and capacity development trainings can be organised to directly engage local community members and create local employment and "green jobs" in the area. These jobs can build local skills and knowledge and help generate further support and future ownership of the measure. The project team will review each measure and delegate tasks based on the stakeholders who are best situated to complete them. Depending on the measures selected, this step may involve engaging outside experts, such as engineers or other relevant technical experts to implement the measures.

The project team will lead the development of a timeline for implementation. The timeline should be disseminated widely so that all stakeholders are aware of the plans.

Successful implementation of EbA measures is contingent upon a number of factors, outside of the on-the ground work. There is a need to develop a communications plan for the measure to ensure that information is being shared with all stakeholders in a transparent way.

Form 7A: Delegation of tasks and timeline for implementation

Step 8:
Influencing policy



<u>Objective:</u> Identify and document the key lessons learned from the implementation of the EbA measure, and share them with relevant government agencies to trigger policy change.

The final step of the EbA process aims to ensure that the measure and the process of implementing EbA, has a far-reaching impact, allowing both the successes and challenges to be shared more widely in Thailand and at the global level, and to build recognition of the potential for EbA to support climate change adaptation.

The monitoring and evaluation results from Step 6 should be disseminated amongst relevant decision -makers in government in an easily digestible way, to highlight the effectiveness of EbA for the water sector. Increasing visibility of EbA amongst policy makers can help to build momentum for EbA approaches, and potentially gain access to additional funding support for EbA. When sharing specific case studies with governments, project teams should also include a cost effectiveness comparison to highlight the implementation and maintenance costs of EbA measures compared to traditional grey infrastructure.

It is also important to highlight links between EbA and local or regional economic development benefits, including the generation of livelihoods or avoided damage to agriculture or infrastructure due to the implementation of EbA. Considering the range of benefits provided by EbA measures, this step should target a range of potential policymakers, including those responsible for climate change adaptation and mitigation, environment and biodiversity, natural resources management, infrastructure development, agriculture, and economy, among others.

In this step, the project team and relevant government agencies will analyse the potential policy implications of the results. This can include, for example, documenting how the measure supports Thailand's Climate Change Master Plan and other related policies on water management in Thailand. The results of the EbA implementation process will also be used to raise awareness among decision-makers and build support for the expansion and scaling-up of Ecosystem-based Adaptation measures with River Basin Committees, and at a global scale. Finally, government stakeholders will draft recommendations to influence future policy at the local, provincial and national levels.

Activities

1. Organise a one-day policy workshop to disseminate the key conclusions and recommendations. Engage key decision makers in this step to ensure ownership and policy uptake. Participants invited to join the workshop should include:

a. Senior technical and policy officials from water and land-use ministries
b. Senior technical and policy officials from the finance and economic planning ministries
c. Representatives of groups of key primary stakeholders, such as Indigenous People's associations or farmer's associations
d. Civil society organisations
e. NGOs
f. Key private sector representatives

2. Following the workshop, a separate meeting should be organised with relevant government officials to draft policy briefs and determine how to best mainstream project results.

The project team should prepare a short presentation on the process of developing, selecting, implementing and monitoring the EbA measures, highlighting the key results and pre-identifying potential policy opportunities.


Form 8A: Policy opportunities and plans

Outputs

1	Action plan to mainstream EbA into climate-sensitive sectors and policies, plans and strategies
2	Case studies and policy briefs that provide feedback on the strengths and weaknesses of the EbA solution to influence policy to support uptake and mainstreaming.

Additional resources

Venton, P. (2010). *How to integrate climate change adaptation in to national-level policy and planning in the water sector*. Tearfund.

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Annex 1
Land Use Classifications

Source: Land Development Department, Thailand

Level 1	Level 2		Level 3	
Urban and	U1	City, Town, Commercial	U101	City, Town, Commercial
Built-up land	U2	Village	U200	Abandoned village
			U201	Thai village
			U202	Hill tribe village
			U203	Moken village
	U3	Institutional land	U301	Institutional land
		Communication		Abandoned communication
	U4	Transportation, and utility	U400	transportation, and utility
			U401	Airport
			U402	Railway station
			U403	Bus station
			U404	Harbor
			U405	Road
			U406	Railway
	U5	Industrial land	U500	Abandoned factory Industrial land
			U501	Industrial estate
			U502	Factory
			U503	Agricultural product trading
	U6	Other built-up land	U600	Abandoned area
			U601	Recreation area land
			U602	Resort, Hotel, Guesthouse
			U603	Cemetery
			U604	Refugee camp
			U605	Gasoline Station
	U7	Golf course	U700	Golf course
			U701	Abandoned golf course

Level 1	Level 2		Level 3	
Agricultural land	A1	Paddy field	A100	Abandoned paddy field
			A101	Paddy field
	A2	Filed crop	A200	Abandoned field crop
			A201	Mixed field crop
			A202	Corn
			A203	Sugarcane
			A204	Cassava
			A205	Pineapple
			A206	Tobacco
			A207	Cotton
			A208	Mungbean
			A209	Soybean
			A210	Peanut
			A211	Kenaf, Jute
			A212	Black bean, Red bean
			A213	Sorghum
			A214	Castor bean
			A215	Sesame
			A216	Upland rice
			A217	Potato
			A218	Jam potato
			A219	Sweet potato
			A220	Watermelon
			A221	Millet
			A222	Ginger
			A223	Cabbage
			A224	Tomato
			A225	Aloe Vera
			A226	Agave
			A227	Paper mulberry
			A228	Sunflower
			A229	Chili
			A230	Wheat
			A231	Barley
			A232	Rye
			A233	Opium

Level 1	Level 2		Level 3	
			A234	Marihuana, Hemp
			A235	Roselle
			A236	Taro
	A3	Perennial	A300	Abandoned perennial
			A301	Mixed perennial
			A302	Para rubber
			A303	Oil palm
			A304	Eucalyptus
			A305	Teak
			A306	Magosa
			A307	Casuarina
			A308	Acacia
			A309	Pterocarpus sp.
			A310	Gmelwa sp.
			A311	Mangrove
			A312	Coffee
			A313	Tea
			A314	Mulberry
			A315	Bamboo
			A316	Kapok
			A317	Betel palm
			A318	Rain tree
			A319	White cheesewood
			A320	Croton sp.
			A321	Indian mahogany
			A322	Agalloch
	A4	Orchard	A400	Abandoned orchard
			A401	Mixed orchard
			A402	Orange
			A403	Durian
			A404	Rambutan
			A405	Coconut
			A406	Litchi
			A407	Mango
			A408	Cashew
			A409	Jujube

Level 1	Level 2		Level 3	
			A410	Custard apple
			A411	Banana
			A412	Tamarind
			A413	Longan
			A414	Guava
			A415	Papaya
			A416	Jack fruit
			A417	Santol
			A418	Rose apple
			A419	Mangosteen
			A420	Langsat
			A421	Rakum, Sala
			A422	Lime
			A423	Sub-tropical fruit
			A424	Manila tamarind
			A425	Elaeocarpaceae
			A426	Dragon fruit
			A427	Pomelo
			A428	Sapodilla
			A429	Plummango
			A430	Burmese grape
			A431	Pomegranate
	A5	Horticulture	A500	Horticulture
			A501	Mixed horticulture
			A502	Truck crop
			A503	Floricultural/Ornamental plant
			A504	Vine
			A505	Pepper
			A506	Strawberry
			A507	Passion fruit
			A508	Raspberry
			A509	Herbs
			A510	Grass plantation
			A511	Rattan
			A512	Cantaloupe
			A513	Okra

Level 1	Level 2		Level 3	
			A514	Asparagus
			A515	Mushroom
	A6	Swidden cultivation	A600	Bush fallow
			A601	Mixed field crop (Shifting cultivation cultivation)
			A602	Corn (Shifting cultivation)
			A603	Sugarcane (Shifting cultivation)
			A604	Cassava (Shifting cultivation)
			A605	Pineapple (Shifting cultivation)
			A606	Tobacco (Shifting cultivation)
			A607	Cotton (Shifting cultivation)
			A608	Mungbean (Shifting cultivation)
			A609	Soybean (Shifting cultivation)
			A610	Peanut (Shifting cultivation)
			A611	Kenaf, Jute (Shifting cultivation)
			A612	Black bean, Red bean (Shifting cultivation)
			A613	Sorghum (Shifting cultivation)
			A614	Castor bean (Shifting cultivation)
			A615	Sesame (Shifting cultivation)
			A616	Upland rice (Shifting cultivation)
			A617	Potato (Shifting cultivation)
			A618	Jam potato (Shifting cultivation)
			A619	Sweet potato (Shifting cultivation)
			A620	Watermelon (Shifting cultivation)
			A621	Millet (Shifting cultivation)
			A622	Ginger (Shifting cultivation)
			A623	Cabbage (Shifting cultivation)
			A624	Tomato (Shifting cultivation)
			A625	Aloe Vera
			A626	Agave (Shifting cultivation)
			A627	Paper mulberry (Shifting cultivation)
			A628	Sunflower (Shifting cultivation)
			A629	Chili (Shifting cultivation)
			A630	Wheat (Shifting cultivation)
			A631	Barley (Shifting cultivation)

Level 1	Level 2		Level 3	
			A632	Rye (Shifting cultivation)
			A633	Opium (Shifting cultivation)
			A634	Marihuana, Hemp (Shifting cultivation)
			A635	Roselle(Shifting cultivation)
			A636	Taro (Shifting cultivation)
	A7	Pasture and farm	A700	Abandoned farm house
			A701	Pasture
			A702	Cattle farm house Pasture and farm house
			A703	Poultry farm house
			A704	Swine farm house
	A8	Aquatic plant	A801	Mixed aquatic plant Aquatic plant
			A802	Reed
			A803	Lotus
			A804	Water caltrop
			A805	Water chestnut
			A806	Water spinach
			A807	Watercress
	A9	Aquacultural land	A900	Abandoned aqua cultural land
			A901	Mixed aqua cultural land
			A902	Fish farm
			A903	Shrimp farm
			A904	Crab/Shellfish farm
			A905	Crocodile farm
	A0	Integrated farm/ Diversified farm	A001	Integrated farm/ Diversified farm
Forest land	F1	Evergreen forest	F100	Disturbed evergreen forest
			F101	Dense evergreen forest
	F2	Deciduous forest	F200	Disturbed deciduous forest
			F201	Disturbed deciduous forest
	F3	Mangrove forest	F300	Disturbed mangrove forest
			F301	Dense mangrove forest
	F4	Swamp forest	F400	Disturbed swamp forest
			F401	Dense swamp forest

Level 1	Level 2		Level 3	
	F5	Forest plantation	F500	Disturbed forest plantation
			F501	Dense forest plantation
	F6	Agro-forestry	F600	Disturbed agro-forestry
			F601	Dense agro-forestry
	F7	Beach forest	F700	Disturbed beach forest
			F701	Dense beach forest
Water body	W1	Natural water body	W101	River, canal
			W102	Lake, lagoon
			W103	Ocean
	W2	Artificial water body	W201	Reservoir
			W203	Farm pond
			W203	Irrigation canal
Miscellaneous	M1	Grass/ Shrubland	M101	Grass
			M102	Shrubland
			M103	Giant thorny bamboo
	M2	Marsh and Swamp	M201	Marsh and Swamp
	M3	Mine, pit	M300	Abandoned mine, Pit
			M301	Mine
	M4	Other miscellaneous land	M401	Material dump
			M402	Landslide
			M403	Rock out crop
			M404	--
			M405	Landfill
	M5	Salt flat	M500	Abandoned salt flat
			M501	Salt flat
	M6	Beach	M601	Beach
	M7	Garbage dump	M701	Garbage dump

Forms for the Guidebook for the Design and Implementation of Ecosystem-based Adaptation in River Basins in Thailand

Step 1: Stocktaking and Planning

Form 1A: List of core project team members and roles

Number	Name	Gender	Role in the Project Team	Area of Expertise
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Form 1B: Literature review results

Basin name and focal area:	
Team member completing form:	
Date form completed:	

Key Questions	Information collected	Additional data sources/links
Community and land use		
Have there been previous consultations with the water users at the site? What were the needs mentioned?		
Who are the key stakeholders in the focal area? Consider relevant government agencies, local communities, minority groups and Indigenous people's groups, private sector partners (to be developed further in Form 1C)		
Are they any recent land use maps for the focal area? What are the main land uses in the basin?		
Biodiversity and natural resources		
What are the key species (flora and fauna) within the site?		
What existing natural resources management policies influence the site, either positively or negatively?		

Key Questions	Information collected	Additional data sources/links
Climate change projections and relevant measures		
What are the climate change projections for the site? What are the historical trends? Have any previous vulnerability assessments been completed?		
How will these climate change projections impact local livelihoods, infrastructure and ecosystems? What trends for what hazards have been identified?		
Have any grey or green water management measures previously been implemented at the site or nearby areas? What were the lessons learned in implementation? Can any previous measures be scaled up or replicated?		
Plans influencing the site		
What are the ongoing or existing government plans for the focal area? E.g. river basin plans, plans from agriculture or fisheries sectors, planned grey infrastructure		

Form 1C: Stakeholder analysis

1. Government agencies
    a. Local level
    b. Provincial level
    c. National level
2. River Basin Committees
3. Local communities
    a. Indigenous People's groups
    b. Women's groups
    c. Minority groups
    d. Youth
    e. Farmer's cooperatives
    f. Religious groups
4. Private sector
5. Non-profit organisations

Stakeholder Name *(e.g. Youth group)*	**Contact Person** *(Phone, email, address)*	**Influence** *How can they influence the project and how much influence do they (low, medium high)?*	**What are the stakeholder's priorities?** *(e.g. water availability)*	**How could the stakeholder contribute to the project?** *(e.g. helping to identify potential restoration areas)*

Form 1D: Initial Community Workshop

Key Questions	Interview Results
Understanding current climate change impacts and coping mechanisms	
What are the most pressing climate change impacts that the stakeholders are currently facing?	
How has climate change impacted local livelihoods? Are different groups affected in different ways?	
What are the community's current mechanisms for coping with climate change impacts? Are they effective? How much do they cost?	
Understanding future climate change impacts and disaster response	
How will climate impacts change in the future?	
Are there any plans to address the identified climate impacts?	
Who is leading the planning and implementation?	
How will the community cope with future climate threats? How will this be funded?	
Ecosystems, ecosystem services and biodiversity	
What are the key ecosystems located within the focal area?	
What are the most important ecosystem services from these ecosystems? Who do they support?	
Are there any species of importance (endemic, endangered, or economically important) that reside within the focal area? Which habitats do they rely on?	
Have there been any changes in key species that are connected with climate change impacts?	
Is the basin experiencing any changes in environmental conditions as a result of mining, pollution, waste or other manmade actions?	

Form 1E: Example agenda for a one-day consultation workshop with stakeholders and preliminary capacity building needs assessment

09:00-09:30	Opening remarks and introduction to the objectives of the workshop, round of stakeholder and project team introductions
09:30-10:00	Project team presentation of literature review results and key gaps
10:00-10:30	Group discussion on literature review and additional resources and information
10:30-10:45	Coffee break
10:45-12:00	Overview of EbA: definition and process, examples from Thailand
12:00-13:00	Lunch
13:00-13:30	Preliminary capacity building needs assessment (using form below)
13:30-14:30	Mixed breakout groups: priority issues and the potential for EbA to address them
14:30-15:15	Plenary discussion and review of group discussions
15:15-16:00	Closing and next steps

Form 1F: Preliminary capacity building needs assessment

Topic *(e.g. biodiversity survey)*	**Skills Needed** *(e.g. ability to identify local flora and fauna)*	**Methods to build capacity** *(e.g. training from NGOs)*	**Timeframe required** *(e.g. 3 weeks)*	**Lead team member responsible**	**Priority** *(Low, medium, high)*

Form 1G: Drafting a preliminary EbA vision

Key questions	Proposed answers
What is the overall vision for the basin? Is there an existing vision from the river basin management plan?	
What are the main climate vulnerabilities in the basin?	
How do these vulnerability impact local stakeholders?	
Which ecosystems within the basin can help to reduce climate vulnerabilities?	
What is the long-term adaptation goal for the basin?	
What support is needed to achieve this goal?	

Form 1H: Template for five page summary

1. Introduction to the basin
    a. Location
    b. Land use
    c. Biodiversity, ecosystem services and environment
    d. Population
        1) Key livelihoods
        2) Key socio-economic / demographic factors
    e. Hydrological data
2. Climate change data
    a. Historical data
    b. Climate projections and anticipated impacts
3. Key data gaps
    a. Plans to address data gaps
4. Plans for the basin
    a. Ongoing or future development plans
    b. Previously implemented interventions
    c. Relevant natural resource management policies
5. Water user needs and priorities
    a. Key stakeholder groups and roles
    b. Climate change impacts and coping mechanisms
    c. Priority challenges and needs by stakeholder group
    d. Capacity building needs
6. Preliminary EbA vision, validated by stakeholders

Step 2: Conduct a Climate Risk Vulnerability Assessment

Form 2A: Summary of key vulnerabilities highlighted in the CRVA

Questions	Information collected
Climate data	
Describe the seasons in the study area, including high and low temperatures, average precipitation and extreme weather events	
Has climate variability been observed at the site? Are there records of changes in weather patterns and historical trends?	
What do the most recent IPCC Assessment Reports report as the predicted changes in climate in the focal area in terms of changes in rainfall, temperature and climate hazards?	
What are the key climate-related hazards in the basin? Are there maps of climate-related hazard areas?	
Are there local or regional climate change models available?	
Climate hazards and adaptation	
What are the key climate-related hazards in the basin?	
Which people, livelihoods and assets are in locations in which they could be affected by climatic hazards and impacts?	
Which characteristics make these people, livelihoods or assets sensitive to climate change?	
How are local people adapting to adverse climate change impacts?	
Is there any local knowledge or technology that can support adaptation?	

Questions	Information collected
Non-climatic stressors	
What are the non-climatic stressors that affect ecosystems? *(e.g. encroachment, waste disposal, poaching)* Are these stressors increasing or decreasing?	
Impacts of climate change and other stressors on ecosystems, communities and livelihoods	
How do the trends in rainfall, temperature and extreme weather events affect ecosystems and resource availability?	
What impacts do these climate and non-climate stressors have on livelihoods?	
Which species are more vulnerable to climate impacts?	
Which social groups are most vulnerable to climate impacts?	
Which economic or financial resources are available or missing for enhancing adaptation capacity?	

Step 3: Mapping the ecosystems and assessing ecosystem services

Form 3A: Rapid ecosystem services assessment for river basins

Guidance on Form 3A:

The stakeholder consultation on ecosystem services should focus mainly on provisioning and regulating services, as these will be the most important services for increasing climate change resilience. Cultural and supporting services should be also be assessed; they may be less relevant in the EbA development process, but can be important to consider in terms of potential trade-offs and co-benefits (e.g. impacts on habitat for wildlife, or eco-tourism).

One form should be completed for each ecosystem within the focal area. The importance of each ecosystem service should be assessed using the following scale:

++ Ecosystem services that provide a significant positive benefit to stakeholders

+ Ecosystem services that provide a positive benefit to stakeholders

0 Ecosystem services that provide a negligible benefit to stakeholders

? Ecosystem services for which stakeholders are unsure, or lacking data on.

Key Importance **++ Significant positive benefit** **+ Positive benefit** **0 Negligible benefit** **? Gaps in evidence**		**Ecosystem assessed:** **GPS Coordinates** **Date:** **Facilitator:**				
		Importance and Users	Scale of benefit: Local (L), Regional (R), Global (G)	Trends: Increasing (I), Stable (S), Decreasing (D) (U) Unknown	List climate threats	List non-climate threats
Provisioning services	Freshwater					
	Wild fisheries					
	Aquaculture					
	Agriculture					
	Fiber					
	Fuel					
	Biodiversity					

Key Importance **++ Significant positive benefit** **+ Positive benefit** **0 Negligible benefit** **? Gaps in evidence**		**Ecosystem assessed:** **GPS Coordinates** **Date:** **Facilitator:**				
		Importance and Users	Scale of benefit: Local (L), Regional (R), Global (G)	Trends: Increasing (I), Stable (S), Decreasing (D) (U) Unknown	List climate threats	List non-climate threats
Regulating services	Temperature regulation					
	Surface water regulation (floods and droughts)					
	Water purification					
	Groundwater recharge					
	Erosion regulation					
	Salinity regulation					
	Storm regulation					
	Fire regulation					
Cultural services	Cultural heritage					
	Recreation, tourism and aesthetic value					
	Spiritual and religious value					
	Education and research					
Supporting services	Soil formation					
	Primary production					
	Nutrient cycling					
	Water recycling					
	Provision of habitat					

Adapted from:

RRC-EA (2020) Rapid Assessment of Wetland Ecosystem Services: A Practitioner's Guide. Ramsar Regional Center - East Asia, Suncheon, Republic of Korea.

Form 3B: Example agenda for a one-day consultation on ecosystem mapping and ecosystem services assessment

09:00-09:30	Opening and project updates
09:30-10:30	Introduction to EbA and ecosystem services
10:30-10:45	Coffee break
10:45-12:15	Breakout groups: Ecosystem services assessment (Form 3A) and mapping
12:15-13:15	Lunch
13:15-15:00	Plenary: Revision of the results from the breakout groups, selection of key ecosystem services to conserve or restore (Form 3)
15:00-15:30	Closing remarks

Step 4: Developing an EbA vision

Form 4A: Guiding questions for developing an EbA vision with stakeholders

Component	Current Status (summary of information from Steps 1-4)	Vision/Expectations for (insert timeframe)
Climate Vulnerability *Use data from Step 1- Stocktaking and Step 2- Vulnerability Assessment*	*Explain the key climate vulnerability in the basin that affect stakeholders.*	*Explain the expected reduction in climate vulnerability.*
Societal challenges resulting from climate risk *Use data from Step 1- Stocktaking and Step 2- Vulnerability Assessment*	**Total # of people impacted:** # of people **directly impacted:** # of women: # of men: # people **directly impacted:** # of women: # of men: *Explain how the stakeholders are impacted focusing on climate related impacts.* Stakeholder categories may differ depending on the area, e.g. the key groups should be reflected.	**Total # of beneficiaries:** # of people **directly benefitting:** # of women: # of men: # people **directly benefitting:** # of women: # of men: *Identify SMART human outcomes, explain how the communities will benefit, emphasizing on benefits for vulnerable groups*
Biodiversity *Use data from Step 1- Stocktaking (biodiversity assessment), and Step 4- Ecosystem and Ecosystem Services*	*Status of key species*	*Identify clear and measurable biodiversity outcomes*

Component	Current Status (summary of information from Steps 1-4)	Vision/Expectations for (insert timeframe)
Developing an EbA approach		
Ecosystem and ecosystem services *Step 4*	*Key ecosystems and ecosystem services.* *Importance, scale, climate threats and trends*	*Priority ecosystem and ecosystem services expected trends after EbA intervention*
EbA approach/vision	*Inform the scale of the interventions, pre-selection of EbA approaches from Table 3 in the Guidebook, and map of priority intervention sites*	
Governance	*Which governance mechanisms will be put in place to ensure inclusion of communities and all relevant stakeholders in the decision-making process, document capacity building needs*	
Funding	*Explain the overall funding mechanisms, and financial sustainability plan*	
Sustainability and mainstreaming	*Explain the plan to ensure the lessons learned are share through policy uptake and mainstreaming*	

Form 4B: Example agenda for a one-day consultation on EbA Visioning

09:00-09:30	Opening remarks and updates on the project since the last consultation
09:30-10:00	Introduction to EbA visioning: purpose and approach
10:00-10:15	Coffee break
10:15-12:00	Breakout groups: Developing an EbA vision with stakeholders
12:00-13:00	Lunch
13:00-15:00	Plenary discussion: harmonising the vision, integrating inputs from all stakeholder groups
15:00-15:30	Closing and next steps

Step 5: Developing a Theory of Change to identify and validate EbA measures

Form 5A: Concept note for selected EbA measures

1	Measure description		
1.1	Name of the measure		
1.2	Overall description of the measure (technical intervention and summary of outcomes)		
1.3	Baselines, vulnerability assessments, or technical studies that are already available to support the identification or design of the measure		
1.4	Measure Location(s) (site name(s)/GPS coordinates) and area covered by the intervention		
1.5	Expected immediate outcomes of the measure		
1.6	Expected long term outcomes of the measure		
1.7	Major outputs of the measure		
1.8	Number of beneficiaries (Disaggregated by gender)		
1.9	Activities linked to the measure	**Description**	**Key Outputs**
	Activity 1 title		
	Activity 2 title		
	Activity 3 title		
	Activity 4 title		
1.10	Risks and assumptions		

2	**Measure Implementation**
2.1	Lead implementer
2.2	Implementing partner(s)
2.3	Relevant local government partners and their roles *(whether directly or indirectly involved)* and description of involvement
2.4	Additional partners and their roles *(community, non-government organizations, other government partners, etc.)*
2.5	Implementation timeline for the measure
2.6	Estimated budget (THB) to implement this measure?
3	**Sustainability**
3.1	Cost benefit analysis
3.2	Financial sustainability
3.3	Integration within policy and planning

Form 5B: ToC Guidance

Measure	Activities	Outputs	Short-term outcomes	Long-term outcomes	Impact
Write the EbA measure to be implemented in More complicated projects may have multiple EbA measures, so you can add more yellow boxes as needed	**Main activities needed to implement the EbA measure/s.** Activities can include on-the-ground implementation (e.g. planting trees), as well as capacity building, communication and policy activities	**The key outputs or deliverables of the activities.** E.g. number of people trained, area of wetland restored...	Add the expected short-term or immediate outcomes. I.e. what will the activities & outputs lead to in the short term? E.g. immediate result for ecosystem services provision, habitats, households, etc.	**Write in the expected longer term or intermediate outcomes of the EbA measure/s.** I.e. what are the expected result for the ecosystem, the communities, the policy environment, etc, over a longer period, more directly link to the expected impact?	**Write down the overall desired impact of the EbA measure/s.** I.e. what long-term goal or vision are the measures contributing to? Impacts should be specific to the climate change context, communities and ecosystems involved.

Use the purple boxes for assumptions, i.e. conditions/events that need to occur for the measure to be successful. E.g. continued govt support for EbA.

Use the red boxes for risks. These can be risks to the success of the EbA measure, as well as safeguards risks. E.g. local people's livelihoods are negatively affected

Use the blue circles to identify key monitoring points. I.e. key results that should be monitored. You can add draft indicators here if you like.

Timeframe: Years of the project / program

Key:

Risk: | Assumption: | Key monitoring point

Form 5C: NbS Criteria Assessment

Criteria	Indicators		Guiding questions	Answers from the team
1. NbS effectively address societal challenges	*1.1*	The most pressing societal challenges for rights holders and beneficiaries are prioritised	Are societal challenges identified? Are rights holders and beneficiaries consulted? Are the most pressing societal challenges for rights holders and beneficiaries prioritised?	
	1.2	The societal challenges addressed are clearly understood and documented	Are the drivers and responses to the societal challenges identified? Are the societal challenges understood at the relevant national/local context? Are the societal challenges documented and accessible to affected stakeholders?	
	1.3	Human wellbeing outcomes arising from the NbS are identified, benchmarked and periodically assessed	Are human wellbeing outcomes relevant to the identified societal challenges identified? Are there benchmarks in place to monitor impact? Are outcomes and benchmarks assessed at regularly occurring intervals? Are human wellbeing outcomes incorporated into the strategy for the intervention?	

Criteria	Indicators		Guiding questions	Answers from the team
2. Design of NbS is informed by scale	*2.1*	Design of NbS recognises and responds to the interactions between the economy, society and ecosystems	Are interactions identified between the economy, society and ecosystems? Does that include those within and surrounding the intervention area? Is the change in these interactions considered over time? Are potential knock-on impacts on and from other areas identified? Are these interactions used to design the intervention and decision making processes?	
	2.2	Design of NbS integrated with other complementary interventions and seeks synergies across sectors	Are complementary interventions identified in and around the area? Is the design of the NbS integrated with relevant complementary interventions? Are synergies sought in project management, monitoring and outcomes? Are complementary interventions and synergies re-assessed throughout the intervention time scale?	

Criteria	Indicators		Guiding questions	Answers from the team
2. Design of NbS is informed by scale	*2.3*	Design of NbS incorporates risk identification and risk management beyond the intervention site	Have the drivers of internal and external risks been identified? Has scientific and local knowledge concerning those risks been taken into account? Does the design of the NbS take into account possible internal and external risks? Has a risk management plan been integrated into the design of the NbS? Will this risk management plan be revisited throughout the intervention time scale?	
3. NbS result in net gain to biodiversity and ecosystem integrity	*3.1*	NbS actions directly respond to evidence-based assessment of the current state of the ecosystem and prevailing drivers of degradation and loss	Is the current state of relevant ecosystems assessed? Is this assessment at the appropriate spatial and temporal scale? Are the drivers of ecosystem degradation and biodiversity loss assessed? Does the assessment include field verification? Does the assessment take into account scientific and local knowledge? Do NbS actions respond to the assessment and identified drivers of degradation and loss?	

Criteria	Indicators		Guiding questions	Answers from the team
3. NbS result in net gain to biodiversity and ecosystem integrity	*3.2*	Clear and measurable biodiversity conservation outcomes are identified, benchmarked and periodically assessed	Are clear and measurable biodiversity conservation outcomes identified? Are these outcomes based on an understanding of the current ecosystem state? Are these outcomes applicable to the relevant period of time for the intervention? Are benchmarks for desired change in place? Are the conservation outcomes periodically assessed?	
	3.3	Monitoring includes periodic assessments for unintended adverse consequences on nature arising from the NbS	Is a monitoring and assessment plan in place for ecosystems, species and ecological processes? Is the monitoring plan based around measurable variables related to potential adverse impacts on nature arising from the NbS, both direct and indirect? Are actions in response to those impacts in place? Is the monitoring plan properly implemented with measurements taking place at periodic intervals?	

Criteria	Indicators		Guiding questions	Answers from the team
3. NbS result in net gain to biodiversity and ecosystem integrity	*3.4*	Opportunities to enhance ecosystem integrity and connectivity identified and incorporated into the NbS strategy	Are the requirements to maintain or recover ecosystem integrity identified? Are opportunities to enhance ecosystem connectivity and integrity assessed? Are actions in response to these requirements and opportunities incorporated into the NbS strategy?	
4. NbS are economically viable	*4.1*	The direct and indirect benefits and costs associated with the NbS, who pays and who benefits, are identified and documented	Are the direct and indirect benefits and costs associated with the NbS and who receives them identified? Is this fully documented? Is this verified with key informants? Can “winners” and “losers” be easily ascertained?	

Criteria	Indicators		Guiding questions	Answers from the team
4. NbS are economically viable	*4.2*	A cost-effectiveness study is provided to support the choice of NbS including the likely impact of any relevant regulations and subsidies	Is cost-effectiveness analysed? Does the study include upfront and recurring direct and indirect costs as well as the full flow of benefits overtime? Are the key assumptions of cost-effectiveness identified? Does the study include measuring the impact of any relevant regulations and subsidies? Does the study support the choice of actions for the intervention? Is a sensitivity analysis conducted against critical variables?	
	4.3	The effectiveness of an NbS design is justified against available alternative solutions, taking into account any associated externalities	Are available alternative solutions identified? Is the intervention design's effectiveness justified against available alternative solutions? Is this justification documented? Are associated externalities adequately taken into account?	

Criteria	Indicators		Guiding questions	Answers from the team
4. NbS are economically viable	*4.4*	NbS design considers a portfolio of resourcing options such as market-based, public sector, voluntary commitments and actions to support regulatory compliance	Is there a comprehensive review of resourcing options? Does this review cover the costs of delivery of the intervention's primary and ancillary benefits? Has a full resourcing package been assembled and negotiated? Does this resourcing package include provision for future revenue streams?	
5. NbS are based on inclusive, transparent and empowering governance processes	*5.1*	A defined and fully agreed upon feedback and grievance resolution mechanism is available to all stakeholders before an NbS intervention can be initiated	Is there a legitimate feedback and grievance mechanism? Are affected stakeholders consulted for the development of this mechanism? Is this mechanism documented, predictable and transparent? Is this mechanism available and accessible to all stakeholders? Is the mechanism available to stakeholders from before the start of the intervention? Is the mechanism right-compatible? Is the ownership and trust of the mechanism evident? Is the mechanism regularly reviewed and adapted?	

Criteria	Indicators		Guiding questions	Answers from the team
5. NbS are based on inclusive, transparent and empowering governance processes	*5.2*	Participation is based on mutual respect and equality, regardless of gender, age or social status, and upholds the right of Indigenous Peoples to Free Prior and Informed Consent (FPIC)	Are indigenous peoples impacted, either directly or indirectly, at any point during the intervention? Does the intervention uphold the right of Indigenous Peoples to Free Prior and Informed Consent throughout the intervention timescale? Is participation based on mutual respect and equality? Are there processes in place to support this throughout the intervention timescale?	
	5.3	Stakeholders who are directly and indirectly affected by the NbS have been identified and involved in all processes of the NbS intervention	Are the stakeholders who are directly and indirectly affected by the NbS identified? Is their impact and interest in the intervention mapped? Are they involved in all processes of the intervention? Do affected stakeholder accept and feel ownership over the outcomes of the intervention?	

Criteria	Indicators		Guiding questions	Answers from the team
5. NbS are based on inclusive, transparent and empowering governance processes	*5.4*	Decision-making processes document and respond to rights and interests of all participating and affected stakeholders	Are decision-making processes being documented? Is this documentation transparent and accessible? Do they respond to the rights and interests of all participating and affected stakeholders? Is specific attention paid to stakeholders subject to extreme inequity?	
	5.5	Where the scale of the NbS extends beyond jurisdictional boundaries, mechanisms are established to enable joint decision-making among the stakeholders in those jurisdictions affected by the NbS	Do ecological processes and functions of the ecosystems in the intervention extend beyond jurisdictional boundaries? If so, is joint decision-making being enabled among the stakeholders affected by the NbS in all jurisdictions? Are transboundary cooperation's agreements created between affected stakeholders in all jurisdictions?	

Criteria	Indicators		Guiding questions	Answers from the team
6. NbS equitably balances trade-offs between achievement of their primary goal(s) and the continued provision of multiple benefits	*6.1*	The potential costs and benefits of associated trade-offs of the NbS intervention are explicitly acknowledged and inform safeguards and any appropriate corrective actions	Are costs and benefits both at the NbS site and the larger landscape/ seascape, throughout the NbS intervention time-scale identified? Are the potential NbS costs and benefits of associated trade-offs explicitly acknowledged? Are they used to inform safeguards? Are they used to inform corrective actions if those safeguards are passed? Is the process of decision-making regarding costs and benefits disclosed to affected stakeholders?	
	6.2	The rights, usage of and access to land and resources, along with the responsibilities of different stakeholders are acknowledged and respected	Are the rights, usage of and access to land and resources as well as stakeholder responsibilities identified? Are they incorporated into a stakeholder mapping analysis? Are they acknowledged and respected? Do they inform the design of the intervention?	

Criteria	Indicators		Guiding questions	Answers from the team
6. NbS equitably balances trade-offs between achievement of their primary goal(s) and the continued provision of multiple benefits	*6.3*	Established safeguards are periodically reviewed to ensure that mutually-agreed trade-offs limits are respected and do not destabilise the entire NbS	Are there mutually agreed upon limits of trade-offs and are they being respected? Are there established safeguards in place to prevent these being exceeded or to prevent trade-offs destabilising the entire ecosystem or land/ seascape? Are these safeguards being periodically reviewed? Is clear documentation of safeguards and their review provided?	
7. NbS are managed adaptively, based on evidence	*7.1*	A NbS strategy is established and used as a basis for regular monitoring and evaluation of the intervention	Is there a strategy for the intervention for how societal challenges will be addressed? Does the strategy precisely state intended outcomes, actions and assumptions in regards to economic, social and ecological conditions? Does the strategy elaborate on whether and how assumptions may change? Is it consistently being used as a basis for regular monitoring and evaluation of the intervention?	

Criteria	Indicators		Guiding questions	Answers from the team
7. NbS are managed adaptively, based on evidence	*7.2*	A monitoring and evaluation plan is developed and implemented throughout the intervention lifecycle	Is there a robust monitoring and evaluation plan in place? Is it being implemented throughout the lifecycle of the intervention? Does this plan include how deviations of the strategy trigger an adaptive management response?	
	7.3	A framework for iterative learning that enables adaptive management is applied throughout the intervention lifecycle	Is there a plan to learn and adapt in response to the monitoring and evaluation plan? Is there a learning framework applied to the NbS for iterative learning throughout the intervention lifecycle? Does this enable adaptive management? Is there are strategy for how learning persists beyond the time frame of the intervention?	

Criteria	Indicators		Guiding questions	Answers from the team
8. NbS are sustainable and mainstreamed within an appropriate jurisdictional context	*8.1*	NbS design, implementation and lessons learnt are shared for triggering transformative change	Are NbS design, implementation and lessons learnt being systematically captured? Are they being shared both on demand and with strategic audiences? Is this sharing accessible to target audiences? Is a communication strategy in place? Does this strategy detail how communication will change behaviours and how this will trigger transformational change?	
	8.2	NbS inform and enhance facilitating policy and regulation frameworks to support its uptake and mainstreaming	Are policy, regulations and laws relevant to the intervention being identified? Are their impacts and opportunities being mapped? Are early adopters and entry points being identified? Are the interventions actions and communications informing or enhancing facilitating policy and regulation frameworks? Is this supporting uptake and mainstreaming of NbS?	

Criteria	Indicators		Guiding questions	Answers from the team
8. NbS are sustainable and mainstreamed within an appropriate jurisdictional context	*8.3*	Where relevant, NbS contribute to national and global targets for human wellbeing, climate change, biodiversity and human rights, including the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP)	Are relevant national and global targets for human wellbeing, climate change, and biodiversity and human rights being identified? Does this include UNDRIP? Are the interventions actions contributing to any of these targets? Is this contribution being reported in relevant platforms? IS this facilitating mainstreaming and upscaling of the intervention?	

Adapted from:

IUCN (2020). Global Standard for Nature-based Solutions. A user-friendly framework for the verification, design and scaling up of NbS. First edition. Gland, Switzerland: IUCN.

Step 6: Developing a monitoring and evaluation framework for the EbA measures

Form 6A: Indicator table

Indicator [7]	Indicator type [8]	Indicator category / topic [9]	Summary of logic / assumptions / thresholds for indicator [10]	Summary of method/s to be used [11]	Proposed data sources
EXAMPLE: Number of community members trained in sustainable fisheries management who participate in fisheries management & cooperatives	Output	Community capacity	Training in sustainable fisheries management is a key supporting activity for the EbA measure (wetlands restoration). Communities will be co-managing fish conservation zones, fishing cooperatives etc, to complement wetlands restoration	1. Number of community members who participate in and complete training provided (total number men, total number women) 2. Number of community members in fisheries management committee and in fishing cooperatives (total number men, total number women) 3. Percentage of list 1 that also appear in list 2 To be calculated annually	List of participants in training courses Lists of members of fisheries management committees

[7] Tip: It is good practice to frame the indicator neutrally, e.g. 'level of flood damage', instead of using positive/negative framing, 'reduced flood damage'

[8] (e.g. input, output, outcome)

[9] (e.g. climate risk , disaster risk, community capacity, co-benefit, cost/trade-off, contextual)

[10] (i.e. relevance of indicator and how to see whether it is showing a positive or negative outcome)

[11] (i.e. brief description of data collection and analysis methods, frequency)

Indicator [7]	Indicator type [8]	Indicator category / topic [9]	Summary of logic / assumptions / thresholds for indicator [10]	Summary of method/s to be used [11]	Proposed data sources
EXAMPLE: Trends in household income from fisheries	Outcome (intermediate)	Climate risk reduction (income/job security); co-benefit (economic)	The majority of households in the project site rely on fisheries as main source of income. In the past 20 years, yields have declined. An increase in income from fisheries suggests an improvement in economic wellbeing for households. Reasons for increase (e.g. changes in equipment, prices) will also need to be clarified.	Household survey data from existing dataset (provides 10 year trends in project area) Additional household survey every 2 years during project implementation, conduct together with community members To be calculated biennally	Agricultural Census 2016 and 2026

Indicator [7]	Indicator type [8]	Indicator category / topic [9]	Summary of logic / assumptions / thresholds for indicator [10]	Summary of method/s to be used [11]	Proposed data sources
EXAMPLE: Trends in economic losses from flooding in the project area	Outcome (intermediate)	Climate risk reduction; disaster risk reduction	Yes: Incorporates different categories of losses from flooding (household losses + public assets + agricultural land affected)	Damages from flooding in the project area have been increasing in the past 20 years. The wetlands restoration is expected to contribute to reducing the extent/ severity of flood impacts. These economic impacts should be measured in multiple ways. Any reduction in losses represents and improvement, given recent trends.	Damage to public assets calculated annually by Public Works Dept. Two yearly household surveying to include estimated household losses due to flooding. Flood extent maps from Water Dept. to be used to estimate agricultural land affected. To be calculated biennially

Form 6B: Summary table for review and adaptive management

Part 1 – summary of M&E results				
EbA measure	**Expected outcomes / impacts**	**Indicators related to outcomes / impacts**	**Results / progress made to date**	**Changes/ alterations needed**
Part 2 – Summary of progress towards EbA vision				
Component	**Vision/ expectation for this component**	**Key M&E results related to this component**	**Progress made to date**	**Any steps to improve progress towards this component/ vision?**
Climate vulnerability				
Societal challenges resulting from climate risk				
Biodiversity				
Ecosystem and ecosystem services				

Step 7: Implementing EbA Measures

Form 7A: Delegation of tasks and timeline for implementation

Step #	Description Activity	Responsible partner	Duration

Timeline for EbA implementation - shade in the boxes for each step during the week that it should take place

Week/ Step	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15
1															
2															
3															
4															
5															
6															
7															

Step 8: Influencing policy

Form 8A: Policy opportunities and plans

	Policy opportunity	Responsible government department	Focal person in government	What needs to be done?	Steps to achieve goal	Deadline	Lead team member
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							

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