Building urban ecological networks for conservation in the ASEAN region

A discussion paper on increasing connectivity amongst urban protected areas, OECMs, and green and blue spaces

Ministry of Environment

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Acronyms

ACB: ASEAN Centre for Biodiversity
AMS: ASEAN Member State
APAP: Asia Protected Areas Partnership
ASEAN: Association of Southeast Asian Nations
AWGNCB: ASEAN Working Group on Nature Conservation and Biodiversity
CBD: Convention on Biological Diversity
CMS: Convention on Migratory Species/Convention on the Conservation of Migratory Species of Wild Animals/Bonn Convention
GBF: Kunming-Montreal Global Biodiversity Framework
GEF: Global Environment Facility
GPS: Global Positioning System
IUCN: International Union for Conservation of Nature
KBA: Key Biodiversity Area
MoEJ: Ministry of the Environment, Government of Japan
NBA: National Biodiversity Authority (An Autonomous and Statutory Body of the Ministry of Environment, Forest and Climate Change, Government of India)
NDC: Nationally Determined Contribution
NGO: Non-governmental organisation
OECM: Other effective area-based conservation measure
PA: Protected area
PCA: Protected and conserved area
PPA: Privately protected area
SDGs: Sustainable Development Goals
UN DESA: United Nations, Department of Economic and Social Affairs
UNDP: United Nations Development Programme
UNEP-WCMC: United Nations Environment Programme World Conservation Monitoring Centre
UNFCCC: United Nations Framework Convention on Climate Change
WCPA: World Commission on Protected Areas
WD-OECM: World Database on Other Effective Area-Based Conservation Measures

Country acronyms:
BN: Brunei Darussalam
KH: Cambodia
ID: Indonesia
LA: Lao People's Democratic Republic (PDR)
MY: Malaysia
MM: Myanmar
PH: Philippines
SG: Singapore
TH: Thailand
VN: Viet Nam

Executive summary

Urbanisation is one of the most significant and rapidly rising threats to biodiversity globally, and Southeast Asia is projected to experience one of the greatest increases in urbanisation and population growth worldwide in the next few decades. Despite accommodating large populations within the built environment, urban areas, particularly in Southeast Asia, often overlap with biodiversity hotspots, offering critical opportunities for conservation. Urban biodiversity, however, faces significant threats from the pressures of rapid urban development.

To address this, the region can benefit from establishing "urban ecological networks for conservation" to reduce urban habitat fragmentation and connect urban nature areas, such as urban protected areas (PAs), other effective area-based conservation measures (OECMs), and green and blue spaces. This would enhance ecological connectivity, facilitate species movement across fragmented urban landscapes, and maximise the ecological and social value of urban nature areas. This approach aligns with the Kunming-Montreal Global Biodiversity Framework (GBF), particularly Target 3 (PAs and OECMs) and Target 12 (urban green and blue spaces), both of which emphasise the importance of connectivity. However, the overlapping definitions of PAs, OECMs, and green and blue spaces in urban settings can create confusion; clarifying these definitions is critical to understanding their respective roles and connections to broader GBF targets, including Target 3, Target 12, and related goals.

Hence, this discussion paper aimed to (1) clarify the complexities amongst PAs, OECMs, and green and blue spaces in urban settings by providing working definitions and a concept map that compares their similarities and differences, and (2) provide a framework to strategically connect isolated urban nature areas by building urban ecological networks for conservation. To support this effort, a survey was sent to regional experts, and several regionally relevant working definitions and criteria, as well as a concept map, were developed based on their responses. The survey was also used to collect regional examples and suggestions for enhancing urban nature areas. Additionally, an adaptable step-by-step framework was developed to support the planning process for building urban ecological networks for conservation at a local level.

These products can guide countries with developing their own adapted definitions and strategies to support planning, implementation, and reporting efforts and transform isolated urban nature areas into integrated systems that support both people and biodiversity.

Recommendations for ASEAN:

- Contextualise urban conservation definitions to support planning, management, and reporting (based on Section 2):
    - Organise consultations with national urban planning and protected and conserved area (PCA) experts, local governments, and other relevant stakeholders to refine the working definitions and criteria provided for urban PAs, OECMs, and green and blue spaces for national and local contexts
    - Develop a regional framework to help local ASEAN governments create comprehensive plans for their cities that include considerations for building technical capacity and identifying, establishing, managing, and reporting urban nature areas under GBF Target 3 (urban PAs and OECMs) and Target 12 (urban green and blue spaces) while aligning with CBD indicators and other relevant targets
- Strategically increase urban connectivity for biodiversity conservation (based on Section 5):
    - Work with ASEAN cities to assess key connectivity priorities and identify gaps to enhance ecological corridors, particularly for locally significant and threatened species, in alignment with GBF Target 4
    - Support the development of research-backed roadmaps for improving ecological connectivity through spatial modelling, stakeholder engagement, and citizen science to monitor species and measure connectivity outcomes
- Build capacity and engage communities for urban conservation
    - Increase capacity-building initiatives for local governments and conservation managers to effectively plan, implement, and maintain urban ecological networks for conservation
    - Launch public awareness campaigns highlighting the benefits of urban nature areas, including biodiversity conservation, public health, and recreational opportunities

    - Foster community participation in conservation and monitoring through citizen science platforms, empowering residents as stewards of urban biodiversity

- Mobilise resources and investments

    - Secure increased financial support for the planning, establishment, and maintenance of urban ecological networks for conservation

    - Promote innovative financing mechanisms, such as public–private partnerships, to sustain these efforts in the long term

    - Prioritise funding for urban areas with high biodiversity value and critical ecosystem services to maximise impact

- Monitor and evaluate success

    - Establish robust monitoring and evaluation frameworks to track biodiversity and social outcomes within urban ecological networks for conservation

    - Integrate adaptive management practices to address challenges, including invasive alien species and urban expansion pressures

    - Share lessons learned and best practices through ASEAN platforms to foster regional collaboration and knowledge exchange

1. Introduction

Urbanisation is one of the most significant and rapidly rising threats to biodiversity globally as it causes habitat conversion, degradation, and fragmentation, which lead to species extinction (Kondratyeva et al., 2020; Li et al., 2022; Sumasgutner et al., 2023). While driving economic progress and societal development, urbanisation will increase pressures to convert open land and natural spaces into urban infrastructure; according to Neugarten et al. (2024), approximately 16% of the global land area that supports nature's contributions to people, such as clean water, pollination, and climate regulation, is also highly suitable for conversion into urban, agricultural, or industrial areas, which could lead to conflicts between development and conservation goals.

As populations grow and countries continue to develop, urbanisation is expected to rise globally. Southeast Asia in particular is projected to experience one of the greatest increases in urbanisation and population growth worldwide in the next few decades. Estimates suggest that eight out of the ten Association of Southeast Asian Nations (ASEAN) Member States (AMS) will have more than half of their populations residing in urban areas within the next twenty years, with an additional 69 million people projected to live in ASEAN urban areas by 2034 (Appendix A) (based on data from the United Nations Department of Economic and Social Affairs (UN DESA), 2018). Figure 1 illustrates this dramatic rise across AMS.

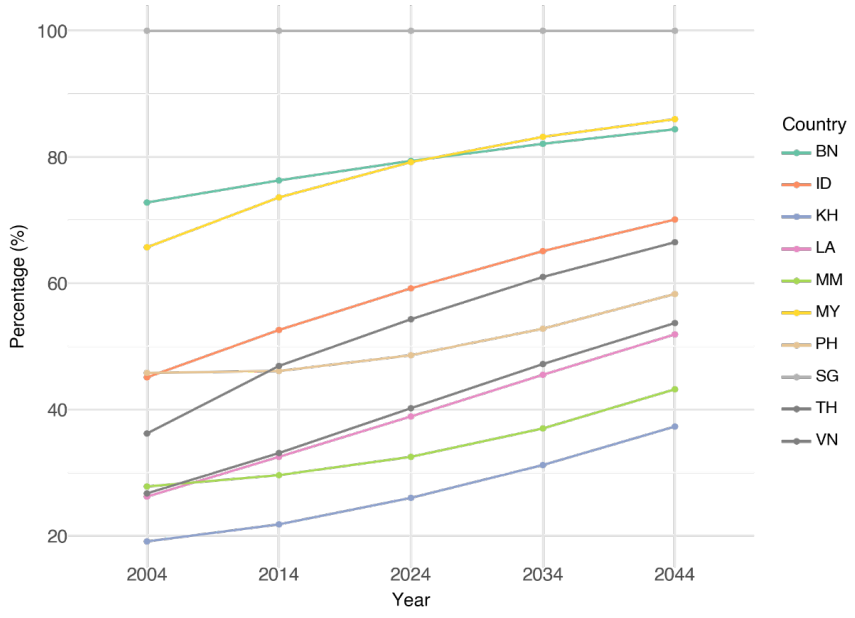


Figure 1. Percentage of population residing in urban areas in the ASEAN region. Projections from 2004 to 2044. Data from UN DESA (2018). BN: Brunei Darussalam; KH: Cambodia; ID: Indonesia; LA: Lao People's Democratic Republic; MY: Malaysia; MM: Myanmar; PH: Philippines; SG: Singapore; TH: Thailand; VN: Viet Nam.

The rise in urbanisation will likely come at the expense of the natural environment, both directly, through habitat loss and changes in biodiversity (including local species extirpation and increases in invasive species), and indirectly, such as through increased pollution, which will affect the health and well-being of urban dwellers (Lechner et al., 2021; The Nature Conservancy, 2018). This is especially detrimental to biodiversity as many urban areas in Southeast Asia fall within biodiversity hotspots (Gopalan & Radhakrishna, 2022). As a result, many Critically Endangered species in the region, such as the Sunda pangolin (*Manis javanica*) and spoon-billed sandpiper (*Calidris pygmaea*), are increasingly at risk of extinction from rising urban pressures. The pressure on these ecosystems not only threatens species but also affects ecosystem services crucial to human survival (San Francisco Estuary Institute, 2019). This underscores the need for integrated strategies that blend urban development with conservation efforts.

Cities can play a key role in biodiversity conservation if designed and managed thoughtfully. Urban nature areas, including urban protected areas (PAs), other effective area-based conservation measures (OECMs), and green and blue spaces, offer significant opportunities to conserve biodiversity and provide ecosystem services within cities. For instance, they can regulate floods by absorbing excess rainwater, mitigate water and air pollution, and capture carbon, thereby contributing to climate change mitigation efforts (San Francisco Estuary Institute, 2019). Additionally, these areas can help reduce the urban heat island effect, which is where city temperatures are higher than surrounding rural areas due to human activities and infrastructure (Gómez-Baggethun et al., 2013). Many cities in the ASEAN region are also more vulnerable to climate change and will be disproportionately more affected by climate events in the future; nature-based solutions, which include urban nature areas, will be a key part of increasing resilience and adaptation to these events (Lechner et al., 2021).

Beyond environmental benefits, urban nature areas have profound implications for human health and well-being. Access to these spaces has been linked to physical health benefits, such as increased physical activity and reduced rates of obesity and heart disease, as well as mental health benefits, such as reduced anxiety and depression (Frumkin et al., 2017; Bratman et al., 2019). Research has also shown that more biodiverse greenery is more beneficial to human well-being (Aerts et al., 2018). Due to their proximity to larger populations and a higher number of regular visitors, urban nature areas can provide support to many more people in this regard compared to remote nature areas (Trzyna, 2014). There is also a greater chance to engage with these visitors through volunteering and educational opportunities, for instance, which could make them more likely to advocate for the environment.

Despite these benefits, these areas also face challenges, as they are more prone to litter, light and noise pollution, and invasive alien species (Trzyna, 2014). Additionally, due to their risk of being fragmented for urban development, urban nature areas are likely to be isolated instead of being a part of larger connected networks. This reduces their ecological value, as research suggests that it is not enough to have isolated nature areas to conserve ecosystem functioning and biodiversity; there must be active measures to maintain, enhance, and restore ecological connectivity to enable species move freely between different habitats, thereby enhancing genetic diversity, supporting migration, and promoting adaptation to climate change (Gross et al., 2016; Hilty et al., 2019; Hilty et al., 2020; Tabor, 2019).

Connectivity is also a key part of the qualitative aspects of Target 3[1] and Target 12[2] of the Kunming-Montreal Global Biodiversity Framework (GBF). In urban areas, this could be achieved by creating "urban ecological networks for conservation" that strategically connect urban PAs, OECMs, and green and blue spaces to help reduce urban habitat fragmentation, facilitate species movement, and enhance the value of otherwise isolated urban nature areas. This would also support many other targets (see Section 4) and beyond. For instance, these networks could contribute to reducing the risk of zoonotic diseases, which have become a significant concern worldwide. Urbanisation and habitat degradation create new opportunities for pathogens to spill over from wildlife to humans, especially in cities that are close to fragmented natural habitats (Dobson et al., 2020). By maintaining intact ecosystems and enhancing connectivity, urban ecological networks for conservation can help mitigate the conditions that promote disease transmission, offering a public health benefit alongside their environmental value.

Given the potential of these networks to support numerous positive impacts, ASEAN cities have a transformative opportunity to reimagine urban areas as more

[1] GBF Target 3: "Ensure and enable that by 2030 at least 30 per cent of terrestrial, inland water, and of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem functions and services, are effectively conserved and managed through ecologically representative, well-connected and equitably governed systems of protected areas and other effective area-based conservation measures, recognizing indigenous and traditional territories where applicable, and integrated into wider landscapes, seascapes and the ocean, while ensuring that any sustainable use, where appropriate in such areas, is fully consistent with conservation outcomes, recognizing and respecting the rights of indigenous peoples and local communities, including over their traditional territories"

[2] GBF Target 12: "Significantly increase the area and quality and connectivity of, access to, and benefits from green and blue spaces in urban and densely populated areas sustainably, by mainstreaming the conservation and sustainable use of biodiversity, and ensure biodiversity-inclusive urban planning, enhancing native biodiversity, ecological connectivity and integrity, and improving human health and well-being and connection to nature and contributing to inclusive and sustainable urbanization and the provision of ecosystem functions and services"

sustainable spaces that enhance biodiversity, build climate resilience, and improve the quality of life for both residents and species.

However, the overlapping definitions of PAs, OECMs, and green and blue spaces in urban settings can create confusion—clarifying these definitions is critical to understanding their respective roles and connections to broader GBF targets, including Target 3, Target 12, and related goals, which will support planning, implementation, and reporting efforts as well.

Hence, this discussion paper has two main aims: (1) to clarify the complexities amongst PAs, OECMs, and green and blue spaces in urban settings, and (2) to provide a framework to build urban ecological networks for conservation. This paper and its resulting recommendations will be shared with ASEAN for their consideration.

The publication is structured as follows:

- Section 2 presents working definitions and a conceptual map to clarify the roles of PAs, OECMs, and green and blue spaces in urban settings
- Section 3 highlights examples and case studies that illustrate the range of urban nature areas in Asia, as well as the lessons learnt
- Section 4 explores how urban ecological networks for conservation align with key global frameworks, including the GBF, SDGs, and ASEAN-specific strategies
- Section 5 outlines strategies for designing and implementing urban ecological networks for conservation, including spatial planning, stakeholder engagement, and funding mechanisms
- Sections 6 and 7 conclude with recommendations for AMS

2. Conceptual framework for urban ecological networks for conservation

2.1. Definitions

To help develop working definitions, an online survey (see Appendix B for the survey questions) was created and sent out to multiple expert networks and contacts in Asia with the support of an informal Consultation Working Group on Building Urban Ecological Networks for Conservation in the ASEAN Region, who also provided input on the draft survey. This group was created and led by the project lead to support the consultation process for this paper. The group had experts from the ASEAN region, as well as South Asia and East Asia, with backgrounds on both urban protected and conserved areas (PCAs, which includes PAs and OECMs) and urban planning.

A total of 32 people responded to the survey, primarily (81.3%) from countries in the ASEAN region (26 responses representing various cities in Indonesia, Malaysia, the Philippines, and Thailand), followed by five from South Asia (representing Nepal, Bangladesh, and India), and one from East Asia (representing China). The respondents included people working for governments, non-government organisations (NGOs), universities, private companies, and a youth network. A full list of the survey respondents who consented to being acknowledged can be found in Appendix C. Appendix D contains the full methodology to analyse the survey responses, as well as the results. It is acknowledged that the majority of ASEAN countries were not represented in the survey; hence, countries can adapt these working definitions for their own national and local contexts as needed.

2.1.1. Relevant existing definitions

- Ecological connectivity: “The unimpeded movement of species, connection of habitats without hindrance and the flow of natural processes that sustain life on Earth" (Convention on Migratory Species (CMS) Resolution 14.16)

- Ecological network for conservation: “A system of core habitats (protected areas, OECMs and other intact natural areas), connected by ecological corridors, which is established, restored as needed and maintained to conserve biological diversity in systems that have been fragmented” (Hilty et al., 2020—IUCN definition)

- Protected area: “A clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long term conservation of nature with associated ecosystem services and cultural values” (Dudley, 2008—IUCN definition)

- Other effective area-based conservation measure: “A geographically defined area other than a Protected Area, which is governed and managed in ways that achieve positive and sustained long-term outcomes for the in-situ conservation of biodiversity, with associated ecosystem functions and services and where applicable, cultural, spiritual, socio–economic, and other locally relevant values” (CBD Decision 14/8)

- Urban protected area: “Urban protected areas are protected areas situated in or at the edge of larger population centres. They meet IUCN’s definition of a protected area and can be in any of its six Management Categories” (Trzyna, 2014—IUCN definition)

2.1.2. New working definitions and criteria from this paper

These are based on the survey responses and existing definitions, as well as considerations for GBF Target 12.

Box 1. New urban area, urban nature area, and urban ecological network for conservation working definitions and explanations for ASEAN and Asian contexts.

Urban area (working definition based on the survey responses): “A densely populated, planned, and developed built environment that has a high density of infrastructure or impervious surfaces”

Urban nature area (working definition): “A geographically defined space in an urban area that is mostly covered by nature, including protected areas, other effective area-based conservation measures (OECMs), and green and blue spaces”

Urban ecological network for conservation*: “A system of strategically connected urban nature areas (urban protected areas, other effective area-based conservation measures (OECMs), and green and blue spaces) that is established, restored as needed, and maintained to conserve biodiversity and reduce habitat fragmentation in urban areas” (adapted from Hilty et al., 2020)

**Alternative terms that can be adapted by countries: Urban conservation network; Urban ecological conservation network*

An **urban PA, OECM, or green and blue space** can simply be considered as a PA (IUCN definition), OECM (CBD definition), or green or blue space in an urban area, as defined above. **See Table 1 for the full list of definitions.**

Explanation of elements and working criteria:

- "densely populated" will need to be defined separately by each country based on their national context and perception

- Infrastructure includes transportation systems, roads, bridges, and more. Impervious surfaces include pavements, buildings (residential, commercial, and/or industrial), and other artificial areas with hard surfaces that prevent water from entering soil

- There are two main types of connectivity: functional and structural, which can overlap. Functional connectivity refers to how well genes, gametes, propagules, or individuals move through land, freshwater, and seascapes, while structural connectivity refers to habitat permeability based on the physical features of habitats to aid connectivity, such as through ecological corridors (Hilty et al., 2020)

Box 2. New green space and urban green space working definitions and explanations for ASEAN and Asian contexts.

Green space (working definition based on the survey responses): "A geographically defined and sizeable natural, semi-natural, or man-made outdoor space that is mostly covered by vegetation". This is a general definition for the term.

To help measure contributions towards GBF Target 12, which refers to urban areas, human well-being, biodiversity, and only has indicators for public areas, a more targeted definition is as follows:

Urban green space (for GBF Target 12) (working definition): "A green space in an urban area that is freely open to the public and guided by long-term governance and management plans that support native biodiversity and include specific considerations for human well-being". See Box 1 for the definition of "urban area". **See Table 1 for the full list of definitions.**

Urban green spaces can be privately accessible as well (i.e., not freely open to the public), though these areas are not currently recognised in GBF Target 12 indicators and most national policies; if privately accessible areas are included in policies in the future, the definition for urban green spaces should be updated accordingly.

Explanation of elements and working criteria:

- "sizeable" will need to be defined separately by each country based on their national context and perception

- "natural" means that the greenery was not added by people (e.g., primary forests), "semi-natural" means that it was partially created by people, and "man-made" means that it was fully created by people, but it should have proper considerations to support native biodiversity

- Green spaces can be on buildings and rooftops that people can access (e.g., rooftop gardens) as these can support birds and other species, but the area should be three-dimensional; i.e.,

green walls do not qualify

- Vegetation includes trees and other plants. The vegetation does not have to be fully native as long as the species do not harm native wildlife, but native flora species should comprise the majority, and invasive species should be managed and removed

- "long-term" typically means permanently in the context of existing IUCN guidance on PAs and OECMs, but this can be adapted for regional and national contexts, e.g., with renewal measures

- "support native biodiversity" means that the governance and management plans are aligned with efforts to maintain or increase native populations

- "specific considerations for human well-being" can include having designated areas for various recreational activities, as long as these are done sustainably and do not have substantial negative environmental impacts

Box 3. New blue space and urban blue space working definitions and explanations for ASEAN and Asian contexts.

Blue space (working definition based on the survey responses): "A geographically defined and sizeable natural, semi-natural, or man-made outdoor waterbody or watercourse". This is a general definition for the term.

To help measure contributions towards GBF Target 12, which refers to urban areas, human well-being, biodiversity, and only has indicators for public areas, a more targeted definition is as follows:

Urban blue space (for GBF Target 12) (working definition): "A blue space in an urban area that is freely open to the public and guided by long-term governance and management plans that support native biodiversity and include specific considerations for human well-being". See Box 1 for the definition of "urban area". **See Table 1 for the full list of definitions.**

Urban blue spaces can be privately accessible as well (i.e., not freely open to the public), though these areas are not currently recognised in GBF Target 12 indicators and most national policies; if privately accessible areas are included in policies in the future, the definition for urban blue spaces should be updated accordingly.

Explanation of elements and working criteria:

- "sizeable" will need to be defined separately by each country based on their national context and perception

- "natural" means that the waterbody/watercourse was not created by people (e.g., a lake), "semi-natural" means that it was partially created by people, and "man-made" means that it was fully created by people, but it should have proper considerations to support native biodiversity. Where possible and appropriate, the area should be connected to the surrounding landscape, if it is man-made, to support more native species

- The waterbody can be a coastal (e.g., water surrounding a beach) or inland water area (e.g., a lake, river, or pond)
- "long-term" typically means permanently in the context of existing IUCN guidance on PAs and OECMs, but this can be adapted for regional and national contexts, e.g., with renewal measures
- "support native biodiversity" means that the governance and management plans are aligned with efforts to maintain or increase native populations
- "specific considerations for human well-being" can include having designated areas for various recreational activities, as long as these are done sustainably and do not have substantial negative environmental impacts

2.2. Key similarities and differences

Urban PAs, OECMs, and green and blue spaces are all geographically defined areas, three-dimensional spaces, governed and managed, include terrestrial, inland water, and/or coastal areas, and can support human well-being and native biodiversity.

The key difference amongst these areas is related to their management objectives: PAs must have *nature* conservation, which goes beyond biodiversity conservation (also includes geodiversity, landforms, and broader natural values; Dudley et al., 2008), as their primary management objective, whereas OECMs and urban green and blue spaces do not need to; both OECMs and urban green and blue spaces can be primarily managed for recreation, education, or other purposes instead of conservation, as long as the other activities there are conducted sustainably. However, OECMs must deliver and demonstrate long-term in situ *biodiversity* conservation *outcomes* regardless of their objectives, whereas urban green and blue spaces do not need to.

Box 4 further explains the three management categories for OECMs. If an OECM has conservation as a primary management objective and is suitable, it could become recognised as a PA. If it is under private governance and management, it could become a privately protected area (PPA).

Box 4. Management categories for OECMs.

The IUCN World Commission on Protected Areas (WCPA)'s Specialist Group on OECMs developed three management category definitions for OECMs: ancillary, secondary, and primary conservation, and these could encompass a variety of areas and governance types.

Ancillary conservation sites deliver in situ biodiversity conservation as a by-product of management activities, rather than intentionally, such as sites protected for historic or cultural values that inadvertently conserve the surrounding biodiversity.

Secondary conservation sites are actively managed for a purpose besides conservation, with biodiversity conservation as their secondary objective, such as a site managed primarily for recreational purposes that has a secondary aim of conserving biodiversity.

Lastly, **primary** conservation sites have conservation as their main objective, such as important natural sites that are specifically set aside for conservation purposes and actively protected from threats. These sites could be classified as PAs based on their objectives but their governing or managing body has chosen to classify them as OECMs instead, for various reasons.

Regardless of their management type, sites across all three categories must deliver long-term *in situ* conservation outcomes.

(IUCN WCPA Specialist Group on OECMs, 2019; Jonas et al., 2024)

Another key difference is that PAs and OECMs count towards GBF Target 3, whereas urban green and blue spaces count towards GBF Target 12. However, GBF Target 12 currently only has an indicator to recognise the "Average share of the built-up area of cities that is green/blue space for public use for all", using a methodology for open public spaces, which are not exclusive to urban green and blue spaces and also not applicable to privately accessible ones, even though this is not specified in the GBF Target 12 description. Both OECMs and PAs, on the other hand, can be private and still count towards GBF Target 3. It should be noted that OECMs are not meant to replace PAs and PAs should still be considered as the first choice for area-based conservation if a site has conservation as a primary management objective, where possible. In situations where PAs cannot be established, OECMs are recommended instead.

Due to definitional overlaps, certain urban OECMs and PAs that are open to the public and include specific considerations for human well-being in their governance and management measures could also be considered as urban green or blue spaces. However, they should be considered as only one category for official reporting purposes, for either GBF Target 3 or 12.

Conversely, it will be more difficult to classify an urban green or blue space as an urban OECM or PA, based on their criteria. According to the latest guidance

document on OECMs developed by the IUCN WCPA Specialist Group on OECMs (Jonas et al., 2024), some areas that are unlikely to qualify as OECMs include: "Small, semi-natural areas within an intensively managed landscape with limited in situ biodiversity conservation value, such as municipal parks, formal/domestic gardens, arboreta, field margins, roadside verges, hedgerows, narrow shoreline or watercourse setbacks, fire breaks, recreational beaches, marinas and golf courses". Although municipal parks, which could be considered as an urban green space, are mentioned in their list of examples, they are not necessarily unsuitable if they are larger and more natural, as mentioned in the previous version of the guidance document (IUCN WCPA Specialist Group on OECMs, 2019): "Urban or municipal parks managed primarily for public recreation, but which are large enough and sufficiently natural to also effectively achieve the in-situ conservation of biodiversity (e.g., wild grassland, wetlands) and which are managed to maintain these biodiversity values" could be considered as options for further screening, and they are likely to fall under the secondary conservation category of OECMs.

Hence, some urban green and blue spaces could be OECMs as well, if they are natural enough and meet the criteria. PAs, on the other hand, have more stringent requirements for conservation that most urban green and blue spaces are unlikely to meet, unless they have a primary conservation objective, important natural values, and specific considerations for human well-being.

2.2.1. Concept map for comparison

To clarify the similarities and differences amongst urban PAs, OECMs, and green and blue spaces, a concept map was created using the working definitions and criteria for these areas (Figure 2). The key working definitions used in the concept map are summarised below:

Table 1. Summary of key working definitions.

Term	Definition
Urban area	A densely populated, planned, and developed built environment that has a high density of infrastructure or impervious surfaces.
Urban nature area	A geographically defined space in an urban area that is mostly covered by nature, including protected areas, other effective area-based conservation measures (OECMs), and green and blue spaces.
Urban ecological network for conservation	A system of strategically connected urban nature areas (urban protected areas, other effective area-based conservation measures (OECMs), and green and blue spaces) that is established, restored as

(adapted from Hilty et al., 2020) **Alternative terms that can be adapted by countries: Urban conservation network; Urban ecological conservation network*	needed, and maintained to conserve biodiversity and reduce habitat fragmentation in urban areas.
Urban protected area	A protected area, as defined by IUCN (Dudley, 2008), in an urban area.
Urban other effective area-based conservation measures (OECM)	An OECM, as defined by the Convention on Biological Diversity (CBD) (Decision 14/8), in an urban area.
Urban green space (for GBF Target 12)	A geographically defined and sizeable natural, semi-natural, or man-made outdoor space in an urban area that is mostly covered by vegetation, freely open to the public, and guided by long-term governance and management plans that support native biodiversity and include specific considerations for human well-being.
Urban blue space (for GBF Target 12)	A geographically defined and sizeable natural, semi-natural, or man-made outdoor waterbody or watercourse in an urban area that is freely open to the public and guided by long-term governance and management plans that support native biodiversity and include specific considerations for human well-being.

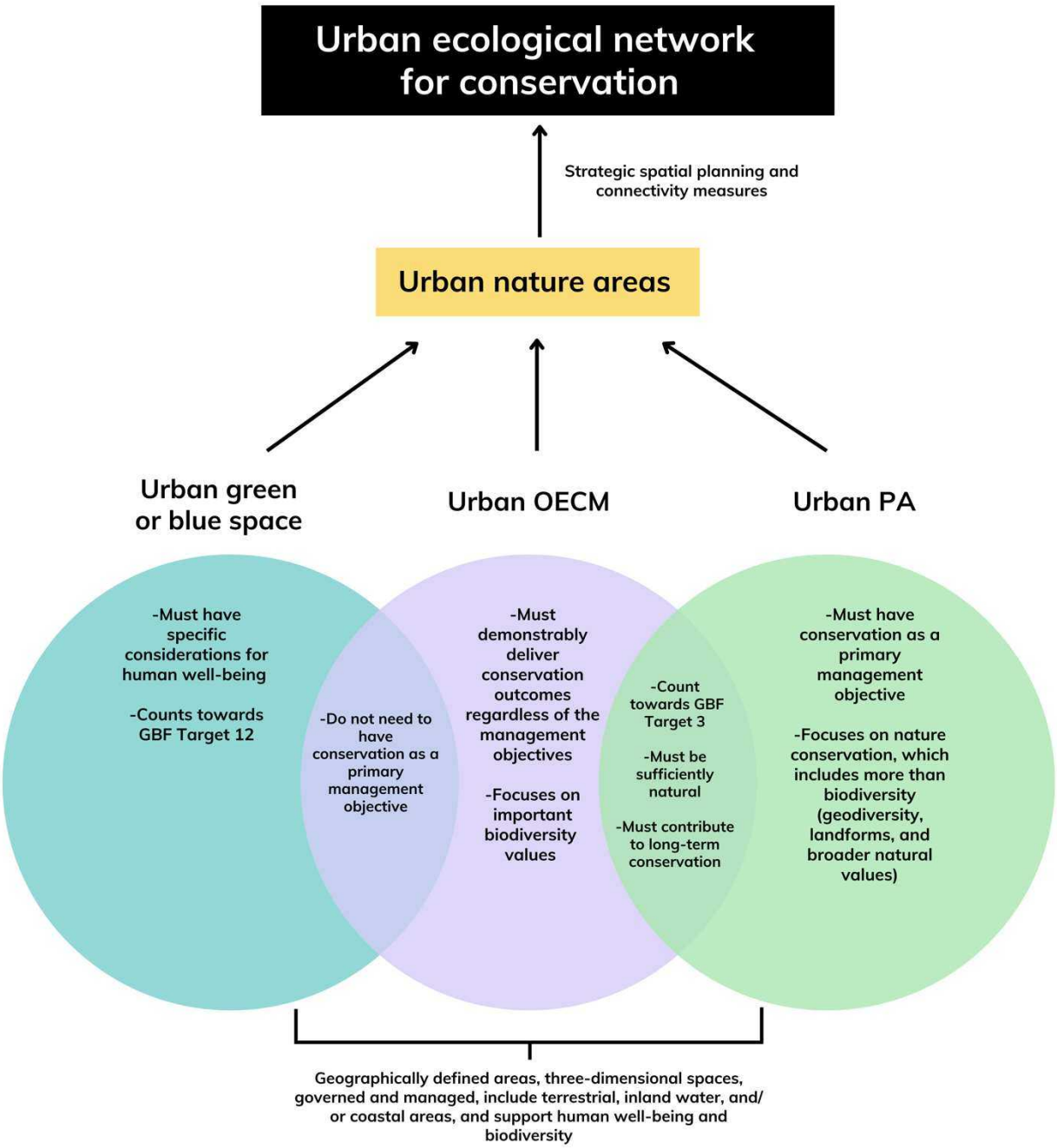


Figure 2. Concept map of an urban ecological network for conservation.

3. Regional examples of urban nature areas

As shown in Table 2, there are many types of areas that could be urban green or blue spaces, OECMs, and PAs. However, OECMs and PAs would need to be assessed first before they can be officially designated—Table 3 provides a case study of applying the IUCN WCPA OECM site-level assessment tool (Jonas et al., 2023) on an urban OECM. PAs that have already been officially recognised and are in an urban area can be considered as urban PAs. Similarly, OECMs that have already been officially recognised and are in an urban area can be considered as urban OECMs.

Boxes 5–7 include more specific regional examples of urban PAs, OECMs, and green and blue spaces, most of which were provided by the survey respondents. These are not intended to be best practice case studies, but they are meant to demonstrate the types of areas being classified regionally and some of the similarities and differences amongst these areas in terms of governance, management, urban pressures, and more.

Table 2. Examples of types of areas that could be urban green or blue spaces, OECMs, and PAs. Includes examples submitted by the survey respondents. This is not an exhaustive list. OECMs and PAs must meet the global and, where applicable, national criteria for these sites.

Potential types of urban PAs, OECMs, or urban green or blue spaces	Potential types of urban OECMs or green or blue spaces (unlikely to be suitable as urban PAs)	Potential types of urban OECMs (unlikely to be suitable as urban PAs or green or blue spaces)	Potential types of urban green or blue spaces (unlikely to be suitable as urban PAs or OECMs)
Key Biodiversity Areas/other designations that recognise important biodiversity values Primary forests and other sites with high ecological integrity Inland water areas Coastal areas Forests and hill ranges with important biodiversity values	Nationally recognised urban conservation areas that are not recognised as PAs Ecological corridors that allow public access Buffer zones that allow public access	Sacred groves Community forests and traditional natural areas Sustainable urban agricultural areas Private grounds with important biodiversity (e.g., around religious buildings, cemeteries, universities, and corporate buildings)	Community gardens Recreational beaches Pocket/mini parks Courtyards with substantial nature Golf courses and other sports fields that include surrounding native biodiversity Botanical gardens Publicly accessible urban farms that also

	have surrounding native biodiversity
Natural public parks with important biodiversity values	Waterfront areas
Areas with insufficiently wild vegetation/degraded areas/previously threatened areas that have been managed and restored/rewilded with important biodiversity features	

**Rooftop OECMs were previously included as an example in this section; this has been amended in this version*

3.1. Examples of urban PAs

The two examples in Box 5 are urban PAs in the Philippines and Bangladesh, both of which were submitted by the survey respondents.

Box 5. Examples of urban PAs in Asia. Submitted by the survey respondents; edited versions presented.

Malabanban Watershed Protected Area

- Location: San Pablo City, Philippines
- Main purpose: Conservation
- Area type: Urban PA
- Ecosystem type: Terrestrial watershed
- Management body: San Pablo City Water District and the local government unit of San Pablo City
- Governance body: San Pablo City Water District and the local government unit of San Pablo City
- Urban pressures or concerns in the site: Pollution and needs biodiversity monitoring

National Botanical Garden

- Location: Dhaka, Bangladesh
- Main purpose: Research, education, recreation, and conservation
- Area type: Urban PA (in Bangladesh, botanical gardens are considered to be PAs)
- Ecosystem type: Terrestrial and freshwater aquatic habitats
- Management body: Ministry of Environment, Forest and Climate Change, Bangladesh
- Governance body: Ministry of Environment, Forest and Climate Change, Bangladesh
- Urban pressures or concerns in the site: Pollution

National Botanical Garden, Dhaka, Bangladesh. Image credit: Khaled0147, CC BY-SA 3.0, via Wikimedia Commons.

3.2. Examples of urban OECMs

Table 3 includes a case study submitted by the Ministry of the Environment, Government of Japan (MoEJ) that demonstrates how the IUCN WCPA OECM site-level assessment tool (Jonas et al., 2023) was applied to an urban OECM in Japan. This urban OECM has been nationally designated and is in the World Database on OECMs (WD-OECM). Additionally, Box 6 includes two more examples—a nationally established urban OECM in India and a proposed urban OECM in China.

Table 3. Case study on Hachioji Nagaike Park, an urban OECM in Tokyo, Japan, based on the IUCN WCPA OECM site-level assessment tool. Submitted by the MoEJ; edited version presented.

Site name and location: Hachioji Nagaike Park (2-58 Bessho, Hachioji City, Tokyo)
Site description: An urban park on a hillside in a residential area. The park is surrounded by wooded areas of *Quercus serrata* and sawtooth oak, reservoirs, rice paddies, and grasslands.

Hachioji Nagaike Park, Tokyo, Japan. Image credit: MoEJ.

Screening assessment	Response	Justification
1. The site is not a protected area	Yes	Not a PA; not in the World Database on Protected Areas
2. There is a reasonable likelihood that the site supports important biodiversity values	Yes	*(a) Rare, threatened or endangered species and ecosystems:* 96 endangered plant species designated by the Ministry of the Environment or Tokyo Metropolitan Government, rare wetland plant groups, and wild extinct species in Tokyo inhabit the area *(b) Natural ecosystems that are under-represented in protected area networks:* The area has been selected by the Ministry of the Environment as an "important satochi-satoyama for biodiversity conservation". The area is a mosaic of diverse ecosystems, including satoyama forests, rice paddies, reservoirs, grasslands, and other ecosystems, mainly composed of native species, and each ecosystem is well maintained through daily management. Through past surveys and ongoing monitoring, 11 species of mammals, 120 species of birds, 6 species of amphibians, 16 species of reptiles, 7 species of fish, 59 species of dragonflies, and approximately 800 species of plants have been confirmed to inhabit this area *(d) Significant populations/extent of endemic or range-restricted species or ecosystems:* Tamano kan-aoi and Yabumugura, which have a limited distribution range in the southern Kanto area, have been observed in this site *(e) Important species aggregations, such as spawning, breeding or feeding areas:* Wintering grounds for red-breasted nuthatches, black thrushes, and mountain snipes; resting areas for migratory shorebirds and songbirds; foraging areas for goshawks, owls, hares, and other birds [the letters are based on the important biodiversity values listed in the OECM site-level assessment tool document, p.5, Jonas et al. (2023)]

Full assessment		
3. The site is a geographically defined area	Yes	19.46 ha (0.19 km^2)
4. The site is confirmed to support important biodiversity values	Yes	Same values as identified in criterion 2
5. Institutions or mechanisms exist to govern and manage the site	Yes	The local government is responsible for governance, the park's designated administrator is responsible for management, and NPOs are responsible for activities in the park
6. Governance and management of the site achieve or are expected to achieve the *in situ* conservation of important biodiversity values	Yes	Threats to important biodiversity values in the site are managed. Threats include the death of tall trees, especially *Quercus serrata* due to attacks by oak bark beetles, and the impact of American crayfish and other aquatic invasive alien species on native species. In response to these threats, the authority has implemented measures such as cutting down dead trees to prevent the dispersal of oak bark beetles, which causes oak wilt. In addition, American crayfish, an invasive alien species, are captured. Other ongoing maintenance activities to support biodiversity are conducted in the site as well
7. *In situ* conservation of important biodiversity values is expected to be for the long term	Yes	The park is owned by the local government and is subject to long-term conservation based on a management plan
8. Governance and management arrangements address equity considerations	Yes	There is a forum for information sharing amongst the city's park managers (chief administrators) held by the chief governing officer, and management occurs through communication with these stakeholders

Box 6. Examples of urban OECMs in Asia.

Aravalli Biodiversity Park

- Location: Gurgaon, India
- Main purpose: Conservation—increase green cover and recharge water levels
- Area type/description: Urban OECM. It spans 158.6 ha (1.59 km^2) and was a previously abandoned mining site. It was transformed into a lush green “City Forest” in 10 years and was declared as India’s first OECM in 2022. The site supports endangered and rare plants in the Northern Aravalli hills, where over 300 native species have been recorded. It also harbours over 201 species of birds and various mammal and reptile species
- Ecosystem type: Terrestrial

- Management body: Government (the Municipal Corporation of Gurgaon) and the corporation Hero MotoCorp Limited
- Governance body: Government (the Municipal Corporation of Gurgaon)
- Urban pressures or concerns in the site: Previously, extensive mining, illegal felling of trees, cattle grazing, and waste dumping had caused serious environmental degradation in this area, until it was restored and managed
  (United Nations Development Programme (UNDP) and National Biodiversity Authority (NBA), 2022)

Aravalli Biodiversity Park, Gurgaon, India. Image credit: T. R. Shankar Raman, CC BY-SA 3.0, via Wikimedia Commons.

Natural Conservation Area in Peking University

- Location: Beijing, China
- Main purpose: Natural university grounds for students and staff. Secondary conservation objective
- Area type/description: Proposed urban OECM. It spans 50 ha and supports over 240 bird species, 600 higher plant species, 11 mammal species, 26 fish species, 11 amphibian and reptile species, 27 butterfly species, and 26 dragonfly species. This includes nationally protected species, a Critically Endangered species, an Endangered species, and five Vulnerable species
- Ecosystem type: Terrestrial
- Management body: Peking University Faculty, Peking University Center for Nature and Society, and Student Associations
- Governance body: Peking University Faculty, Peking University Center for Nature and Society, and Student Associations
- Urban pressures or concerns in the site: Unknown
  (Zhang et al., 2024)

**Rooftop OECMs were previously included as an example in this section; this has been amended in this version*

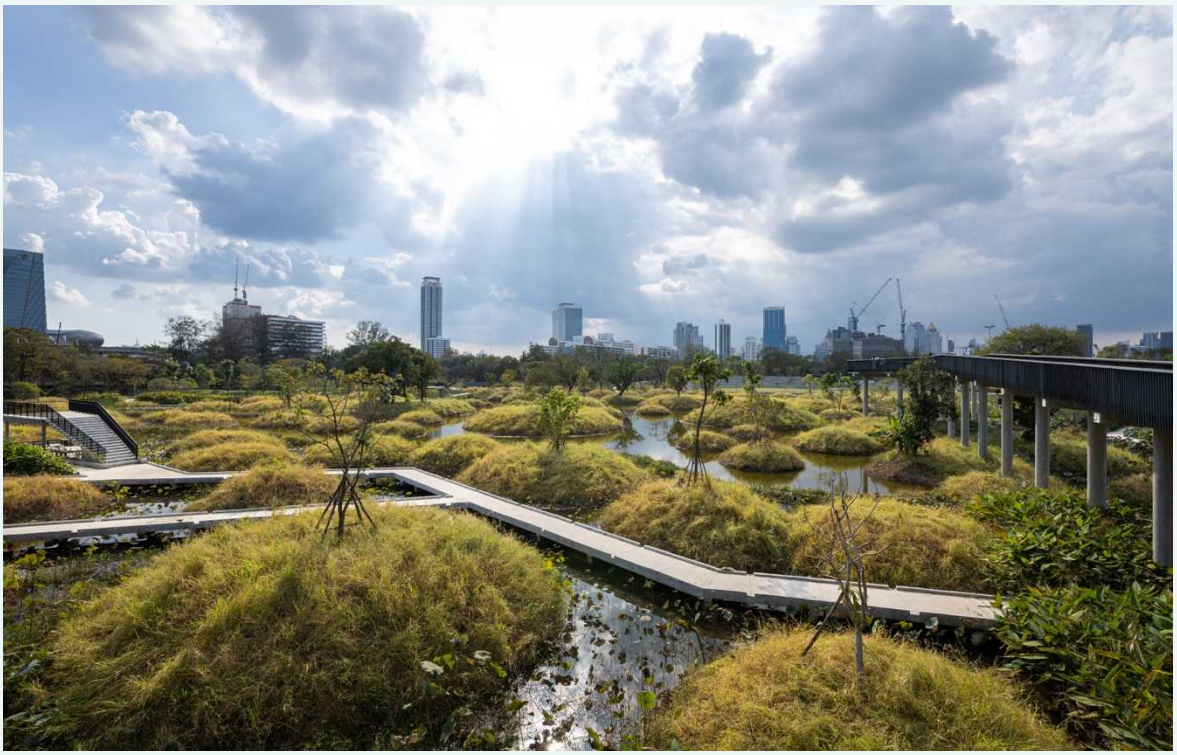
3.3. Examples of urban green and blue spaces

This section includes seven examples of urban green and blue spaces across Asia, which were all submitted by the survey respondents.

Box 7. Examples of urban green and blue spaces in Asia. Submitted by the survey respondents; edited versions presented.

Benjakitti Forest Park

- Location: Bangkok, Thailand
- Main purpose: Recreation, urban flood control, and water filtration
- Area type/description: Urban green space—city park. Formerly a tobacco factory that was restored into a park using innovative and sustainable design techniques. For instance, existing trees were preserved, factory buildings were repurposed into a sports centre and museum, and demolished concrete was recycled for foundations and paving. Cut-and-fill techniques transformed the impermeable site into a porous wetland capable of retaining 200,000m^3 of stormwater, fostering native vegetation with minimal irrigation. The park's diverse micro-environments support a self-sustaining, semi-natural plant community and provide habitat for 91 bird species. Immersive pathways, including boardwalks and a skywalk, offer visitors a unique experience amidst tropical greenery. As Bangkok's largest central park, it serves as a vital green lung, attracting thousands daily and successfully mitigating urban flooding, making it a celebrated icon of the city. It was recognised with an Honor Award for General Design by the 2024 American Society of Landscape Architects' Professional Awards
- Ecosystem type: Terrestrial and wetland
- Management body: Bangkok Metropolitan Administration
- Governance body: Government
- Urban pressures or concerns in the site: Ornamental non-native plants



Benjakitti Forest Park, Bangkok, Thailand. Image credit: Supanut Arunoprayote, CC BY 4.0, via Wikimedia Commons.

Land in Damansara Kim area

- Location: Petaling Jaya, Malaysia
- Main purpose: Private and leased use. There are a few small businesses (plant nursery, hardware store, and a motorbike repair workshop) located by the roadside that are being used under a lease or tenancy agreement
- Area type/description: Urban green space. Narrow strip of privately-owned land of around half a hectare with a remnant secondary forest including some tall trees, and good cover of herbaceous flora, epiphytes, and more. This strip is located on a steep slope sandwiched between two roads
- Ecosystem type: Terrestrial
- Management body: Private land owner
- Governance body: Private land owner
- Urban pressures or concerns in the site: The green area has likely persisted because it is not a state-owned land and, therefore, the land could not be cleared without permission from the land owner. However, it is under threat from land acquisition for road expansion

Land in Damansara Kim area, Petaling Jaya, Malaysia. Image credit: © 2024 Google.

Balanga Wetland and Nature Park

- Location: Balanga City, Philippines
- Main purpose: Tourism and conservation, especially for migratory birds
- Area type/description: Urban green and blue space
- Ecosystem type: Coastal and wetland area with mangroves
- Management body: Government

- Governance body: Government
- Urban pressures or concerns in the site: Flooding

Balanga Wetland and Nature Park, Balanga City, Philippines. Image credit: © 2024 Google.

Mithi River

- Location: Mumbai, India
- Main purpose: Storm water drainage
- Area type/description: Urban blue space
- Ecosystem type: Inland water/river
- Management body: Mithi River Development & Planning Authority, Mumbai Metropolitan and Regional Development Authority, Municipal Corporation of Greater Mumbai, State Forest Department, and Mangrove Cell (different parts under different bodies)
- Governance body: Mithi River Development & Planning Authority, Mumbai Metropolitan and Regional Development Authority, Municipal Corporation of Greater Mumbai, State Forest Department, and Mangrove Cell (different parts under different governing bodies)
- Urban pressures or concerns in the site: Pollution

Taman Persekutuan Bukit Kiara

- Location: Kuala Lumpur, Malaysia
- Main purpose: Recreation, conservation, education, and scientific research
- Area type/description: Urban green space
- Ecosystem type: Terrestrial with rivers
- Management body: National Landscape Department, Ministry of Housing, and the local government body
- Governance body: National Landscape Department, Ministry of Housing, and the local government body

- Urban pressures or concerns in the site: Encroachment by neighbouring land owners, land erosion, and fallen tree cases caused by strong winds from the densely populated environment

Taman Tugu

- Location: Kuala Lumpur, Malaysia
- Main purpose: Recreation and conservation
- Area type/description: Urban green space. It is a famous destination for outdoor activities for city dwellers. The site is 66 acres of secondary forest and used to be a garbage dumping site. 4,000 rare and threatened tree species were brought in and planted on-site to enrich the species composition in the forest. Park entry is free to the public. Activities that can be conducted are hiking across around 7 km of forest trails, plant species identification, and wildlife-watching for birds and other small fauna
- Ecosystem type: Terrestrial
- Management body: Taman Tugu Project Development (a wholly-owned subsidiary of Khazanah Nasional Berhad, Malaysia)
- Governance body: Taman Tugu Project Development. It has shared governance with the support of various public sector agencies and civil-society organisations
- Urban pressures or concerns in the site: Invasive alien species, lack of funds collected to sustain park maintenance, and complying with high expectations from city dwellers

Beijing Olympic Park

- Location: Beijing, China
- Main purpose: Originally constructed for the 2008 Summer Olympics and the 2008 Summer Paralympics; recreational
- Area type/description: Urban green space. Beijing Olympic Forest Park is located in the northern part of Beijing and covers over 680 ha. The park boasts over 300 bird species, including nationally protected species, and supports over 500 higher plant species. In addition, it is home to a Critically Endangered dragonfly species. The area provides critical ecosystem services for Beijing, including climate regulation and significant recreational services for its 20 million residents
- Ecosystem type: Terrestrial
- Management body: The Beijing Olympic Forest Park Management Committee, under the Government of Chaoyang District of Beijing
- Governance body: Government of Chaoyang District of Beijing
- Urban pressures or concerns in the site: Habitat deterioration caused by infrastructure construction and landscaping. In response to this, several local NGOs have started to restore biodiversity in the park since 2020. This has involved restoring native grasses, shrubs, and aquatic plants, and creating habitats and food sources for small animals, birds, and insects. This work continues to the present day

3.4. Lessons learnt

The examples and case studies highlight a multi-faceted approach to creating urban nature areas in the region, underscoring not only the ecological, but also the socio-cultural and governance dimensions of integrating biodiversity conservation into urban landscapes. A deeper comparison reveals some common themes, pointing towards principles and opportunities to refine urban conservation efforts.

Overall, the thirteen regional examples showcase that most of these urban nature areas are terrestrial and governed by governments, and some common threats include pollution and invasive alien species. The urban PAs and OECMs are mainly managed for conservation, while most of the urban green and blue spaces are mainly managed for recreational purposes, though some also have conservation objectives. Increasing publicly-available documentation on regional urban nature areas in the future would provide further insight into their similarities and differences in terms of governance, management, threats, and more. This would enable the status of these areas to be assessed as well, and for countries to learn from others and improve their own practices.

Certain examples and the lessons learnt from them are highlighted below.

3.4.1. Reimagining and transforming degraded spaces

Two of the examples listed were abandoned industrial-use areas—Aravalli Biodiversity Park in Gurgaon, India, and Benjakitti Forest Park in Bangkok, Thailand—and both of their degraded landscapes were transformed into vibrant ecosystems. Benjakitti Forest Park in particular used innovative design methods to transform the site beyond an ordinary park into one that has porous pavements that can store stormwater to reduce flooding. This transformation underscores the potential of rewilding other degraded or abandoned sites in a way that can also provide climate benefits, especially when working with urban landscape architecture and design experts who can provide innovative insights.

3.4.2. Balancing visitor numbers and pollution

Pollution is a known and common threat in urban nature areas due to high visitor numbers, and this is demonstrated across several of the examples listed. This suggests a need for clearer visitor management strategies that balance conservation with public access. Educational measures and public outreach may be needed as well. If these sites were to be connected to other urban nature areas as part of a network, it is important that these measures are implemented across the other sites as well to prevent the same issues from occurring.

3.4.3. Governing and managing sites with the private sector
Several of the sites listed included the private sector in their management bodies, and sometimes governance bodies as well, highlighting the unique opportunity urban nature areas have to collaborate with the private sector, particularly in the case of urban OECMs and green and blue spaces. This approach enables diverse perspectives and financial sources to be incorporated to support the site. However, the privately governed and managed Taman Tugu site in Malaysia also reveals challenges, including insufficient funding and high public expectations. This highlights the need for more robust financial models and clearer communication with the public.

3.4.4. Achieving long-term outcomes through adaptive management
The case studies collectively emphasise that urban conservation requires adaptive management. Sites such as Beijing Olympic Park showcase how adaptive restoration practices can address habitat degradation caused by initial construction activities. Continuous monitoring and adaptive interventions, such as the reintroduction of native vegetation and habitat creation, have allowed this site to maintain its biodiversity value despite being located in a highly urbanised area.

These lessons reveal the opportunities and challenges that exist within urban nature areas in Asia, showcasing the potential complexities of integrating sites like these as part of an urban ecological network for conservation, especially when trying to manage threats. Achieving greater outcomes will ultimately hinge on leveraging unique partnership opportunities, working with the public, and including adaptive management considerations for both ecological and social elements.

4. Alignment with key policy frameworks and strategies

Urban ecological networks for conservation and their components intersect with several global, regional, and national policy frameworks, offering opportunities to align urban conservation efforts with broader strategic goals. By situating urban conservation within these policy landscapes, governments and stakeholders can leverage existing commitments, ensure cohesive implementation, and amplify the impact of urban biodiversity initiatives.

4.1. Global policy frameworks

Urban ecological networks for conservation and their components directly and indirectly contribute to achieving key global targets under the GBF, Sustainable Development Goals (SDGs), CMS, and United Nations Framework Convention on

Climate Change (UNFCCC) (Table 4). Notably, GBF Target 3 focuses on PAs and OECMs, while GBF Target 12 focuses on urban green and blue spaces, and both mention connectivity. Hence, both of these targets include components that are crucial to the formation of urban ecological networks for conservation.

Building these networks would also directly support CMS Resolutions 12.7 and 14.16 on ecological networks and connectivity. Additionally, urban nature areas contribute to making cities more sustainable (SDG 11), acting as nature-based solutions and carbon sinks in alignment with SDG 13, UNFCCC Article 4(d), the Paris Agreement, and the first global stocktake draft decision. By integrating urban nature areas into planning processes, cities can contribute to national climate commitments, such as Nationally Determined Contributions (NDCs). Urban nature areas also encompass both aquatic (SDG 14) and terrestrial (SDG 15) ecosystems and promote good health and well-being (SDG 3) through access to nature, thereby contributing to additional SDGs. Therefore, it is possible to integrate urban ecological networks for conservation into various existing policies and efforts for these targets and others across this section.

Table 4. Relevant global frameworks, goals, and resolutions that are linked to urban nature areas and/or connectivity, including PAs, OECMs, and/or green and blue spaces.

Framework	Relevant sections and related agreements/decisions
United Nations Sustainable Development Goals (SDGs)	Goal 3 (good health and well-being) Goal 6 (clean water and sanitation) Goal 11 (sustainable cities and communities) Goal 13 (climate action) Goal 14 (life below water) Goal 15 (life on land)
Convention on Biological Diversity Kunming-Montreal Global Biodiversity Framework (GBF)	Target 1 (spatial planning) Target 2 (restoration) Target 3 (30x30, PAs, and OECMs) Target 4 (halting species extinction) Target 6 (invasive alien species) Target 8 (climate change) Target 11 (nature's contributions to people) Target 12 (green and blue spaces, urban planning, and human well-being)
Convention on Migratory Species (CMS)	Resolution 12.7 (the role of ecological networks in the conservation of migratory species) Resolution 14.16 (ecological connectivity)

United Nations Framework Convention on Climate Change (UNFCCC)	Article 4(d) (promote the conservation of sinks and reservoirs of greenhouse gases, including forests and oceans) Paris Agreement: Article 5 (take action to conserve sinks and reservoirs of greenhouse gases, including forests/reducing deforestation and degradation) First global stocktake draft decision: paragraphs 33, 55, 63(d) (emphasises conserving, protecting, and restoring nature and ecosystems/encourages the implementation of ecosystem-based approaches and nature-based solutions)

4.2. Regional, national, and local policy frameworks

At the regional level, the ASEAN context offers unique opportunities for integrating urban ecological networks for conservation into regional strategies such as the ASEAN Sustainable Urbanisation Strategy (ASEAN, 2018a), Regional Action Plan for ASEAN Heritage Parks (2023–2030) (ACB, 2023), ASEAN Action Plan for Invasive Alien Species Management (ASEAN and ACB, 2023), ASEAN Socio-Cultural Community Blueprint 2025 (ASEAN, 2016), ASEAN Strategic Plan on Environment 2016–2025 (ASEAN, 2017), and ASEAN Comprehensive Recovery Framework (ASEAN, 2020)[3].

At the national and local level, several AMS and other Asian countries already have policies to increase their urban nature areas, as highlighted in Tables 5 and 6 with examples provided by the survey respondents. Hence, there is already a foundation to develop urban ecological networks for conservation by building upon these efforts.

Table 5. Examples of policies across the ASEAN region that specifically mention urban nature and green/blue spaces. Submitted by the survey respondents; edited versions presented.

Country	Policy
Indonesia	Indonesia's national law stipulates that cities should provide at least 30% of their total area to be green and open public spaces.
Malaysia	According to the Malaysian Planning Guidelines, all developments in Malaysia must allocate at least 10% of the development area for open spaces, which are areas where people can enjoy recreational activities, including urban nature areas. Additionally, developing, conserving, and enhancing urban nature areas is listed in the National Landscape Policy (Dasar Landskap Negara) under Thrust 2, Thrust 3, and Thrust 4.

[3] ASEAN is in the process of developing new strategic frameworks—both ASEAN wide and on a sectoral basis, including one on the environment, as well as an action plan for conserving threatened vertebrate species.

Philippines	Urban areas are one of three thematic areas in the Philippine Biodiversity Strategy and Action Plan (2015–2028), and green spaces are mentioned under Target 6: "By 2028, there will be a 5% increase in the proportion of green spaces in the five largest cities" (Quezon, Caloocan, Manila, Cebu, and Davao). Quezon City is also a signatory to the Urban Nature Accelerator of C40 and is committed to increasing its green spaces from its current number by 2030. The Philippines' policy on green and blue spaces is currently under revision, incorporating feedback and recommendations gathered during the consultation workshop organised by the Department of Environment and Natural Resources-Biodiversity Management Bureau. This evolving framework, tentatively titled "Establishing the Program on Urban Green Space for Enhanced Biodiversity, Climate Resiliency, and Improved Human Well-being, and Its Implementation Guidelines" aims to address the increasing need for sustainable urban development through biodiversity conservation and climate adaptation. The draft policy takes the form of a Joint Administrative Order, reflecting the multi-sectoral nature of its implementation. It is a collaborative effort involving the Department of the Interior and Local Government, Department of Human Settlements and Urban Development, and Department of Environment and Natural Resources. The primary objective of this policy is to establish the Urban Green Space Program and provide comprehensive guidelines to facilitate its adoption. The programme seeks to promote biodiversity conservation and climate resiliency by integrating green spaces and biodiversity into local policies and planning processes, foster biodiversity-friendly urban development programs, and enhance public awareness and appreciation across all sectors.
Thailand	Thailand has national guidelines on sustainable green area management and a national standard for green spaces in cities developed by the Office of Natural Resources and Environment Policy and Planning. Additionally, Thailand's Department of Local Administration integrated urban green area management and conservation activities as criteria in their annual local performance assessments. In Bangkok, many small and large private enterprises are interested in offering their own lands to take part in the Green Bangkok 2030 Project and increase green spaces in their communities. Therefore, for phase 2, the project is currently undergoing a process to officially accept these lands. Upon acceptance, the Bangkok Metropolitan Administration will develop the offered lands as public green spaces.

Table 6. Examples of policies in South Asia (India) and East Asia (China) that specifically mention urban nature and green/blue spaces. Submitted by the survey respondents; edited versions presented.

Country	Policy
China	China's national spatial planning process emphasises the rational layout of ecological spaces, urban spaces, and agricultural spaces, which provides top-level design and policy guidance for the development of urban nature areas. China also has specific policies to promote the construction of green spaces such as urban parks, green belts, and others, which require cities to increase their proportion of green spaces, improve the quality of greening, and provide people with better leisure and ecological environments. For blue spaces, there are policies to strengthen the protection and management of rivers, lakes, and wetlands, improve water quality, and maintain the ecological functions of water bodies. At the local level, Beijing has issued a policy document on "Implementation Opinions on Comprehensively Building a Beautiful Beijing and Accelerating the Modernization of Harmonious Coexistence between Humanity and Nature". This document clarifies the goals, tasks, and measures to build a "beautiful Beijing", including aspects such as green development, pollution prevention, ecological restoration, and urban-rural construction. Hence, it provides a policy basis for the development of urban nature areas in Beijing. Specific measures for urban nature area development include increasing urban greening coverage, improving the quality of green spaces, conducting ecological restoration projects, improving water quality, and developing blue spaces such as waterfront landscapes and water-themed parks to provide people with more recreational spaces by the water.
India	Under the Ministry of Environment, Forest and Climate Change, Government of India, the Nagar Van Yojana programme in India was launched in 2020 to develop Nagar Van (City Forests) across the country in cities with Municipal Corporations or Municipalities. This process has involved local communities, educational institutions, local bodies, NGOs, and others. Each Nagar Van must have a minimum area of 10 hectares, and must have at least two-thirds of its area under tree cover. The Nagar Van should also facilitate the in situ conservation of important flora in the region. The latest target for this programme is to develop 1000 Nagar Vans by 2027. The scheme provides financial assistance of Rs. 4 lakh (~4,735 USD) per hectare for the creation and maintenance of these urban forests to encourage community involvement.

4.3. Strategic opportunities for policy integration

To maximise the potential of urban ecological networks for conservation, several strategic opportunities for policy integration can be pursued:

- Enhancing ecological connectivity: Urban ecological networks for conservation can serve as mechanisms for achieving ecological connectivity, a priority under GBF Targets 3 and 12, and CMS Resolutions 12.7 and 14.16. Policies could encourage spatial planning approaches that integrate protected areas, OECMs, and green and blue spaces to create functional ecological networks, prioritising areas with high biodiversity value.

- Aligning with nature-based solutions: Nature-based solutions are defined as "actions to protect, sustainably manage, and restore natural or modified ecosystems, that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits" (WCC-2016-Res-069). This term is mentioned in GBF Target 8 and in the UNFCCC. Since urban ecological networks for conservation strongly exemplify the principles of nature-based solutions, countries could strategically increase and synergise efforts for nature-based solutions across biodiversity and climate policy frameworks.

- Promoting public and private partnerships: The implementation of urban ecological networks for conservation requires diverse funding sources and governance models. Policies could incentivise private sector involvement, such as through tax benefits or public–private partnerships. These mechanisms could support the creation and maintenance of urban nature areas while ensuring accountability and sustainability. This is also aligned with GBF Target 19, which mentions private financing.

- Strengthening monitoring and evaluation: Robust monitoring frameworks are essential for assessing the ecological and social impacts of urban ecological networks for conservation. Policies could mandate regular evaluations using indicators aligned with GBF Targets 3 and 12, as well as SDG metrics. Integrating citizen science initiatives can enhance data collection and foster community engagement as well.

- Fostering community engagement: Policies could emphasise participatory approaches that involve local communities in the design, management, and monitoring of urban ecological networks for conservation. By highlighting the co-benefits of these networks—such as improved health, recreation, and cultural identity—countries could build stronger public support for conservation initiatives.

By aligning urban ecological networks for conservation with global, regional, national, and local policy frameworks, governments and stakeholders can amplify their impact on biodiversity conservation, climate resilience, and human well-being. These networks offer a transformative pathway to integrate ecological connectivity into urban planning, ensuring that cities contribute to global biodiversity goals while enhancing the quality of life for urban residents. Through strategic alignment, urban ecological networks for conservation can become central to building sustainable, inclusive, and resilient cities across the ASEAN region and beyond.

5. Framework for building urban ecological networks for conservation

5.1. Considerations before implementation

While increasing connectivity through urban ecological networks for conservation offers substantial ecological and social benefits, careful consideration must be given to potential risks to ensure these interventions achieve their intended goals without unintended consequences.

One significant concern with increasing connectivity is the risk of spreading invasive alien species across connected sites. By linking previously isolated areas, ecological corridors may inadvertently facilitate the movement of invasive alien species, amplifying their impacts on native ecosystems. To mitigate this risk, it is essential to prioritise the management of invasive alien species in areas where they are already prevalent before establishing connectivity. This could include measures such as regular monitoring, containment protocols, and targeted removal programmes.

Another concern is the risk of increasing human–wildlife conflict. Certain species from remote areas, particularly larger and more mobile fauna, may begin to venture into urban areas through newly established corridors. These animals might become dependent on urban resources, such as food or shelter, increasing the likelihood of conflict with human populations. Additionally, the movement of such species into urban spaces could introduce novel zoonotic diseases, posing potential public health risks. To address these issues, connectivity measures should prioritise creating access for wildlife to more suitable habitats outside urban areas rather than encouraging their movement into cities. For example, corridors could be strategically designed to lead species towards natural landscapes or protected areas where human interactions are minimised. Urban ecological networks for conservation should also be kept separate from broader ecological networks in remote areas if species likely to cause significant human–wildlife conflict are found there. Complementary management strategies, including buffer zones, controlled access points, and species-specific barriers, could also be employed to mitigate risks and ensure coexistence.

Despite these challenges, substantial scientific evidence indicates that the benefits of ecological corridors and connectivity are far greater than their negative impacts (Hilty et al., 2019). Connectivity is a fundamental element of well-functioning ecosystems; without connectivity, ecosystems are unable to effectively support biodiversity and other elements that sustain life (Hilty et al., 2020). However, even though creating corridors and increasing connectivity is important, the focus should remain on quality rather than quantity. It is not enough to simply create numerous connections between urban nature areas; these connections must be thoughtfully designed to align with ecological requirements, deliver tangible conservation outcomes, and minimise negative impacts.

Ultimately, the goal should be to ensure that corridors are useful for the species in the area, avoid adverse impacts, and support biodiversity conservation.

5.2. Step-by-step framework

The following steps are proposed as a general framework for developing urban ecological networks for conservation to inform planning at the local level (e.g., for roadmap development), which can be adapted as needed (summarised in Figure 3). *For all of these steps, it will be important to follow a collaborative approach to work with stakeholders, increase investments and secure financing for implementation, and build capacity to ensure that personnel can conduct the required tasks.*

Figure 3. Summary of a step-by-step framework to inform local planning for urban ecological networks for conservation.

Step 1. Documenting all existing natural areas within the city

A thorough inventory of all the natural areas within a city is essential to understanding the biodiversity found there. This includes identifying the species present, estimating their population sizes, and documenting other important biodiversity values. Such documentation provides a geographic framework that highlights species under threat and pinpoints their locations, enabling targeted conservation efforts. This step also helps identify areas for further assessment, including those with the potential to qualify as urban OECMs, which must conserve important biodiversity values.

Additionally, it is crucial to assess and document the specific threats these areas face. Addressing threats that could be exacerbated by connectivity measures—such as the spread of invasive alien species—should be prioritised. Proactive management, including the removal of invasive alien species, is necessary before implementing connectivity strategies.

Citizen science initiatives can play a vital role in this documentation process. By involving local communities, these initiatives not only enhance data collection but also foster public engagement in conservation efforts. Box 8 illustrates how such participatory approaches can lead to meaningful conservation outcomes while building stronger connections between urban residents and their natural surroundings.

Box 8. Short case study on using citizen science to support urban biodiversity documentation and more. Submitted by a survey respondent; edited version presented.

The "City Nature Challenge" is an international initiative for people to document plants and wildlife in cities. It is hosted in a way in which cities around the world are in a friendly competition with each other to see who can make the most observations of nature, find the most species, and engage the most people. In 2024, this has resulted in over 2.4 million observations of over 65,000 species, engaging over 83,000 participants worldwide.

In Thailand, this effort was spearheaded by a partnership between a local environmental organisation and an environmental youth network, leading to a four-day youth-led citizen science event in 2024. It resulted in more than 11,400 observations of over 2,130 species in 13 sites across the country. More than 410 volunteers participated in this effort, and they documented their findings using the iNaturalist application. In addition to biodiversity data collection, this initiative also fostered urban-nature connections and helped empower and train youth to become future leaders in broader environmental roles.

Step 2. Understanding the needs of priority species

Urban ecological networks for conservation should be designed to facilitate the unimpeded movement of species across urban areas, in line with the principles of ecological connectivity. To ensure these networks are functional and effective, it is essential to focus on the species that inhabit or move through urban landscapes. This requires a comprehensive understanding of species-specific needs and behaviours, which can be achieved through collaboration with species experts, local communities, and other stakeholders. If existing data on species movement and occurrence are unavailable, targeted efforts to collect this information should be undertaken using tools such as GPS or radio telemetry, camera traps, and other relevant methodologies. Citizen science initiatives can also play a valuable role in monitoring species presence and movement patterns. Importantly, data collection should not cease with the implementation of connectivity measures; ongoing monitoring is necessary to assess their effectiveness and adapt as needed.

Prioritising connectivity for Critically Endangered, rare, and other threatened species is paramount and directly supports GBF Target 4. Measures to enhance connectivity must consider the specific behaviours and movement patterns of these species. For example, arboreal species such as the Critically Endangered Raffles' banded langur in Singapore would benefit most from canopy bridges or similar structures that replicate their natural movement pathways, strategically placed in areas they are known to frequent. Conversely, ground-level crossings would be less effective in such cases.

Additionally, areas with high rates of wildlife mortality due to habitat fragmentation, such as roads frequently crossed by animals, should be prioritised for connectivity interventions. These measures should aim not only to support threatened species, but also to benefit other species that play critical roles in their ecosystems. Where habitats supporting rare or threatened species are not already designated as PAs or OECMs, prioritisation should be given to their formal designation. By addressing these needs comprehensively, urban ecological networks for conservation can enhance biodiversity conservation while reducing the adverse impacts of urbanisation.

Step 3. Incorporating strategic spatial planning and connectivity modelling measures

To effectively address the connectivity needs of priority species, strategic spatial planning measures can be used to evaluate the current network of urban PAs, OECMs, and green and blue spaces to identify opportunities to enhance connectivity amongst these areas. Connectivity modelling tools can be used to help identify the areas that provide the best connectivity value, and experts could be consulted for technical support.

Although it is useful to increase structural connectivity by creating ecological corridors, which should be governed and managed for connectivity (Hilty et al., 2020), it is even more important to consider functional connectivity when choosing models and making decisions for corridors. Functional connectivity ensures that corridors effectively serve their intended purpose, as creating passages that species are unlikely to use provides limited benefits. An online connectivity toolbox created by Conservation Corridor can be used to help choose the most suitable connectivity tool. Additionally, IUCN WCPA has developed "Guidelines for conserving connectivity through ecological networks and corridors" (Hilty et al., 2020) and guidance on "An overview of Participatory, Integrated, and Biodiversity-Inclusive Spatial Planning and Target 1 under the Convention on Biological Diversity Kunming-Montreal Global Biodiversity Framework" (Grantham et al., 2024), which can support this process.

Step 4. Addressing barriers, increasing connectivity, and establishing monitoring and evaluation measures

The process for increasing connectivity should begin with addressing existing barriers that disrupt connectivity. Priority should be given to removing obstacles like dams, which significantly impede freshwater connectivity, and replacing impermeable fences with wildlife-permeable alternatives (Hilty et al., 2020). Afterwards, efforts should focus on creating new connections, such as constructing wildlife corridors, installing fish ladders or bypass reaches (Moberg et al., 2024), and creating smaller "stepping stone" areas that reduce the distance between each site (Hilty et al., 2020). Rewilding degraded areas and transforming underutilised spaces into functional ecological passages can further expand connectivity.

The implementation of larger and more complex connectivity projects often requires substantial investment and careful planning; Box 9 highlights innovative case studies from Utrecht and Singapore, showcasing the successful design, financing, and execution of wildlife corridors. These examples demonstrate how strategic approaches can overcome logistical and financial challenges, making urban connectivity a reality.

Once connections are established, robust monitoring and evaluation protocols must be implemented to measure their effectiveness. These protocols should assess the ecological and social outcomes of connectivity measures, identifying risks and challenges that arise. Adaptive management practices should then be employed to address any emerging issues, ensuring the long-term success and resilience of the network.

Box 9. Short case studies on implementing and financing wildlife corridors.

Eco-passages in the Utrecht Hills
The Utrecht Hills in the Netherlands has several key nature reserves and a national park. However, the area was fragmented with several motorways and railroad lines that prevented wildlife movement. Since the area is part of the Netherlands Nature Network, the province of Utrecht and the responsible nature management agencies, Utrechts Landschap and Gooise Natuurreservaat, were mandated to restore connectivity there for wildlife.

In the Netherlands, the "polluter pays" approach is used in environmental policy. Therefore, the owner and manager of transportation infrastructure was responsible for financing and implementing all eco-passages (green bridges and culverts) in the area.

Along with facilitating wildlife movement, the passages also serve as recreation corridors to support human well-being, by having space for cyclists and pedestrians.
(Hilty et al., 2020)

Mandai Eco-Link
The Mandai Eco-Link is an ecological bridge that was created to connect two different parts of the Central Catchment Nature Reserve in Singapore to support wildlife movement. It is not open to the public. It was voluntarily created and financed by Mandai Park Holdings Pte. Ltd., a private zoological and conservation organisation, and it is governed and managed by them as well to support conservation efforts.

This initiative was a part of the organisation's larger Biodiversity Enhancement and Management Strategy, which includes specific plans to enhance connectivity for wildlife.
(submitted by a survey respondent; edited version presented)

Step 5. Strengthening and enhancing urban ecological networks for conservation

To ensure the long-term viability and effectiveness of urban ecological networks for conservation, it is essential to support these areas with robust regulations and policies that secure their protection and mitigate threats. These passages could also be classified as new OECMs or designated green and blue spaces, depending on how they are managed and if they meet the criteria.

Community involvement plays a pivotal role in strengthening these networks. Engaging urban residents in activities such as restoration, monitoring, and co-management fosters a sense of ownership and commitment to conservation. This not only enhances the ecological value of these areas but also cultivates public advocacy for their preservation. Table 7 illustrates practical ways to enhance urban nature areas, reflecting contributions from survey respondents, many of which align with previously discussed strategies.

While enhancing these spaces, it is equally important to minimise excessive or unnecessary management practices that disrupt natural processes. Examples include limiting the use of pesticides, reducing over-mowing, and allowing natural elements such as leaf litter and decaying trees to remain. Cities worldwide are already adopting such measures; for instance, Eindhoven, the Netherlands, is reducing leaf litter removal to support insect populations, while Montreal, Canada, preserves decaying tree cavities as shelters for small wildlife (World Economic Forum, 2022). These examples demonstrate how thoughtful, nature-aligned management practices can enhance the ecological and social value of urban ecological networks for conservation.

Table 7. Examples of ways to enhance urban nature areas. Submitted by the survey respondents; edited versions presented. Integrated throughout the text above.

Incorporate spatial planning measures: ● Identify land use in urban areas specifically and categorise all open spaces within the city. After that, classify land ownership to explore strategies for protecting, enhancing, or restoring urban nature
Increase financing: ● Increase budgetary investment for their effective management with the full support and ownership of the local governments

Improve management:

- Train the personnel managing the parks to improve management practices
- Increase trail maintenance

Improve policies, regulation, and enforcement:

- Officially designate the areas
- Establish a policy for urban nature areas to ensure their protection and sustainable enhancement. Without a formal policy framework, improvements made to these spaces risk being compromised or reversed by future development activities
- Develop stringent and effective regulations
- Control encroachment
- Improve wildlife enforcement

Increase community involvement and environmental education:

- Use citizen science to document biodiversity using the popular citizen science platform iNaturalist.org
- Engage urban residents with fun and interesting activities
- Gain local community support in co-managing the area
- Highlight how the space benefits the public
- Organise awareness programmes for urban dwellers

Support species conservation based on research:

- Increase native biodiversity and vegetation, insist on endemic species, guard against invasive alien species, and improve the habitat with species and structures to suit the needs of native species and enhance ecosystem functioning
- Support plant genetic conservation
- Plant/introduce Endangered, Rare, and Threatened local forest species

Reduce threats:

- Control pollution
- Manage waste
- Minimise human intervention apart from necessary management activities

Restore and rewild habitats

Create new habitats

Improve connectivity with wildlife corridors and accessible trails:

- Use connectivity modelling tools (e.g., CONEFOR) to integrate spaces
- Improve infrastructure design for corridors

Manage water:

- Use rain gardens and recycle water

Additionally, given the rising risks of climate change that will disproportionately affect the region (Lechner et al., 2021), Box 10 shows a short case study of how Copenhagen developed climate-resilient urban areas with carefully planned and specially designed urban green and blue spaces. On a different scale, focusing on a specific park instead of general urban spaces, a similar approach was applied in Benjakitti Forest Park in Bangkok as well due to issues faced with urban flooding (Box 7). These measures can be integrated into networks as well to simultaneously enhance climate adaptation and biodiversity conservation efforts.

Box 10. Short case study on developing climate-resilient urban areas in Copenhagen. Submitted by a reviewer; edited version presented.

In 2011, Copenhagen, Denmark, faced severe flooding from a cloudburst event that led to almost EUR 1 billion in damages. After developing a comprehensive Cloudburst Management Plan in 2012, Copenhagen is now at the forefront of urban climate adaptation with their innovative approach to integrating green and blue spaces into urban areas.

This initiative aimed to transform the city's neighbourhoods into resilient, multifunctional spaces that combine stormwater management, recreation, and biodiversity. Residents were involved in the planning process, and its design included creating integrated urban green and blue spaces with rain gardens, green beds, retention basins, and permeable pavements that redirect rainwater to recreational blue spaces or underground reservoirs during heavy storms, reducing the risk of urban flooding. These spaces also have native vegetation and support human activities.

Although initial developmental costs were high, the city has shown far greater resilience to storms and flooding since implementation, which would cost even more to control in the long term; hence, the benefits far out-weigh the costs. It has also enhanced the city for both people and biodiversity.

Lastly, a major urban ecological connectivity project that incorporates many of the steps and concepts above is currently underway in Malaysia, described in Box 11.

Box 11. Case study on the *Rantaian* Urban Green Spaces (RUGS) project in Malaysia. Submitted by a contributor; edited version presented.

The Klang Valley, an essential economic and business hub in Malaysia, is a highly urbanised region characterised by fragmented green spaces and biodiversity hotspots. The *Rantaian* Urban Green Spaces (RUGS) project, led by a local NGO under the Global Environment Facility (GEF) Small Grants Programme, aims to connect and rehabilitate these green patches following a community-based approach. The overarching objective for this project is to "…enable community organisations to take collective action for adaptive landscape management in building socio-ecological resilience in the Klang Valley, Peninsular Malaysia for global environmental benefits and sustainable development".

Key targets to achieve by 2026 include:

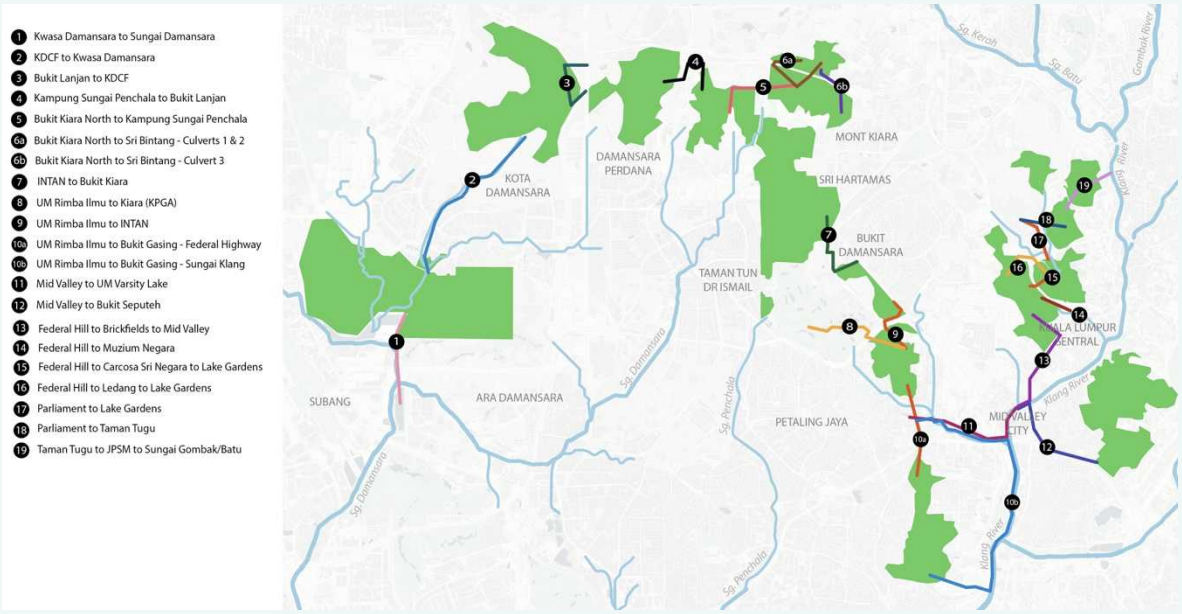
- Restoring 400 hectares of land
- Improving practices across 9,000 hectares of landscapes
- Reducing greenhouse gas emissions by 150 tonnes of CO_2
- Benefiting 10,000 individuals, with 50% being women

The project began in 2023 with a situation analysis, which included a baseline assessment of potential ecological linkages and the biodiversity across green spaces in the area. Landscape data were collected using satellite imagery, GIS tools, online data, and on-the-ground observations, while biodiversity data was recorded from on-the-ground surveys, past studies, and online data (iNaturalist and eBird). From this, a total of 21 green spaces were identified for ecological linkages, and hundreds of diverse flora and fauna species were found in the surveyed areas, including Critically Endangered (Sunda Pangolin [*Manis javanica*] and agarwood [*Aquilaria malaccensis*]) and Endangered ones (Sunda Slow Loris [*Nycticebus coucang*] and Southern Pig-tailed Macaque [*Macaca nemestrina*]). Threats and other considerations were also assessed during this stage.

Upon completing the baseline assessment, the project team devised several plans to support implementation, including an intervention strategy, capacity-building plan, monitoring and evaluation plan, knowledge management plan, advocacy plan, and risk management plan.

The project plans to use two main methods to strengthen ecological connectivity between urban green spaces: (1) land-based corridors and (2) riparian corridors. The land-based corridors would make use of roadside greenery, utility easements (e.g., areas under power lines), and local playgrounds to link fragmented habitats. They would also include the creation of wildlife crossings, such as bridges or tunnels, to help animals safely navigate roads and highways. The riparian corridors would focus on conserving and enhancing vegetation along waterways, including drains, ponds, lakes, and riverbanks, while improving access for wildlife to move across or climb the often steep, canalised edges of these water features.

The potential linkages identified between the urban green spaces are shown in the image below.



(Malaysian Nature Society, 2023)

By combining various planning approaches, the RUGS project is expected to enhance ecological connectivity to support both biodiversity and people in the Klang Valley, and serve as a model for sustainable urban landscape management.

6. Conclusions

This discussion paper had two main aims: (1) to clarify the complexities amongst PAs, OECMs, and green and blue spaces in urban settings by providing working definitions and a concept map that compared their similarities and differences, and (2) to provide a framework to strategically connect isolated urban nature areas by building urban ecological networks for conservation.

As a result, several new working definitions and a concept map were developed based on survey responses, input from the informal Consultation Working Group, and relevant targets. These are meant to provide an informed starting point for ASEAN and other countries to develop more tailored definitions as needed to support clearer and more uniform planning, implementation, and reporting. Additionally, due to the severe threats biodiversity faces from rising habitat fragmentation in urban environments, a step-by-step approach to build urban ecological networks for conservation was developed.

Building urban ecological networks for conservation is a transformative approach to urban sustainability, offering the potential to create significant positive outcomes for

both people and biodiversity. Urban nature areas provide essential ecosystem services that improve urban living conditions and connect millions of urban residents to nature, offering accessible opportunities to engage with biodiversity, enhance physical and mental health, and build public support for conservation efforts.

In addition to their social benefits, urban nature areas contribute to global environmental goals by enhancing carbon sequestration, regulating urban microclimates, and improving climate resilience. They also provide critical refuges for species and support biodiversity conservation even within highly modified landscapes. As urbanisation continues to rise, the strategic development of urban ecological networks for conservation becomes increasingly vital to integrate ecological connectivity into city planning, ensuring long-term environmental sustainability.

By connecting fragmented urban nature areas through strategic spatial planning, urban ecological networks for conservation can amplify their ecological and social benefits. Such networks enhance habitat connectivity, facilitate species movement, and foster the adaptive capacity of urban biodiversity to cope with climate change. Additionally, well-connected networks provide urban residents with greater access to nature, fostering deeper connections with the environment and supporting global, regional, national, and local policy frameworks, including the GBF, SDGs, and UNFCCC.

Overall, developing clear, adapted definitions and comparisons of these areas based on the present work will enable countries to develop a common understanding of urban nature areas, which will support planning, implementation, and reporting efforts. Additionally, developing effectively planned and managed urban ecological networks for conservation has the potential to transform isolated urban nature areas into integrated systems, resulting in improved biodiversity outcomes and more resilient urban ecosystems.

7. Recommendations

As urbanisation continues to reshape the landscapes of Southeast Asia, the ASEAN region stands at a critical juncture to integrate sustainable development with biodiversity conservation. Urban ecological networks for conservation, when strategically planned and implemented, offer a pathway to harmonise urban growth with ecological integrity, ensuring that both people and nature thrive.

The following recommendations provide a starting point for ASEAN to seize the opportunities of urban biodiversity conservation, aligning with global frameworks such as the GBF, SDGs, and UNFCCC.

- Contextualise urban conservation definitions to support planning, management, and reporting (based on Section 2):
    - Organise consultations with national urban planning and protected and conserved area (PCA) experts, local governments, and other relevant stakeholders to refine the working definitions and criteria provided for urban PAs, OECMs, and green and blue spaces for national and local contexts
    - Develop a regional framework to help local ASEAN governments create comprehensive plans for their cities that include considerations for building technical capacity and identifying, establishing, managing, and reporting urban nature areas under GBF Target 3 (urban PAs and OECMs) and Target 12 (urban green and blue spaces) while aligning with CBD indicators and other relevant targets
- Strategically increase urban connectivity for biodiversity conservation (based on Section 5):
    - Work with ASEAN cities to assess key connectivity priorities and identify gaps to enhance ecological corridors, particularly for locally significant and threatened species, in alignment with GBF Target 4
    - Support the development of research-backed roadmaps for improving ecological connectivity through spatial modelling, stakeholder engagement, and citizen science to monitor species and measure connectivity outcomes
- Build capacity and engage communities for urban conservation
    - Increase capacity-building initiatives for local governments and conservation managers to effectively plan, implement, and maintain urban ecological networks for conservation
    - Launch public awareness campaigns highlighting the benefits of urban nature areas, including biodiversity conservation, public health, and recreational opportunities

    - Foster community participation in conservation and monitoring through citizen science platforms, empowering residents as stewards of urban biodiversity

- Mobilise resources and investments

    - Secure increased financial support for the planning, establishment, and maintenance of urban ecological networks for conservation

    - Promote innovative financing mechanisms, such as public–private partnerships, to sustain these efforts in the long term

    - Prioritise funding for urban areas with high biodiversity value and critical ecosystem services to maximise impact

- Monitor and evaluate success

    - Establish robust monitoring and evaluation frameworks to track biodiversity and social outcomes within urban ecological networks for conservation

    - Integrate adaptive management practices to address challenges, including invasive alien species and urban expansion pressures

    - Share lessons learned and best practices through ASEAN platforms to foster regional collaboration and knowledge exchange

By implementing these recommendations, ASEAN Member States can position themselves as global leaders in urban biodiversity conservation and climate resilience. With effective planning, management, and collaboration, urban ecological networks for conservation can safeguard biodiversity, enhance urban sustainability, and improve quality of life for millions of residents across the region.

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Appendices

Appendix A. Population increase in urban areas in AMS across 10 years (in thousands).

Data from United Nations, Department of Economic and Social Affairs, Population Division (2018): "Annual Urban Population at Mid-Year (thousands)". BN: Brunei Darussalam; KH: Cambodia; ID: Indonesia; LA: Lao People's Democratic Republic; MY: Malaysia; MM: Myanmar; PH: Philippines; SG: Singapore; TH: Thailand; VN: Viet Nam.

Country	2024	2034	Population increase
BN	369	414	45
KH	4,582	6,103	1,521
ID	167,177	197,306	30,129
LA	2,934	3,802	868
MY	27,360	31,701	4,341
MM	18,373	22,280	3,907
PH	56,434	69,276	12,842
SG	6,119	6,457	338
TH	37,839	42,260	4,421
VN	40,976	51,241	10,265
Total increase			**68,677 [~69 million]**

Appendix B. Survey questions

Responses were collected from October 14 to November 4, 2024.

* Indicates required question

1. Name*

2. Email*

3. Position and affiliation*

4. City and country*

5. Do you consider this to be a green space?*

Yes
No
Maybe

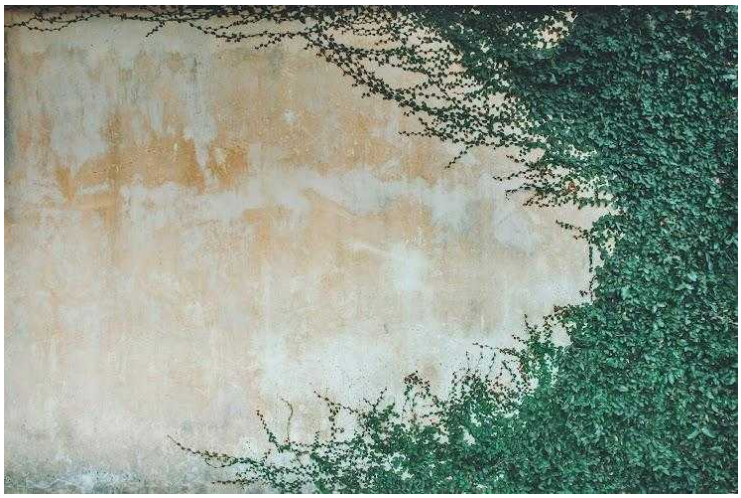
6. Explain your answer to the question above*

7. Do you consider this to be a green space?*

Yes
No
Maybe

8. Explain your answer to the question above*

9. Do you consider this to be a green space?*



Yes
No
Maybe

10. Explain your answer to the question above*

11. Do you consider this to be a blue space?*

Yes
No
Maybe

12. Explain your answer to the question above*
13. Do you consider this to be a blue space?*

Yes
No
Maybe

14. Explain your answer to the question above*

15. Do you consider this to be a blue space?*

Yes
No
Maybe

16. Explain your answer to the question above*

17. What are some criteria or elements that should be used to define an “urban area”, in your opinion? Please provide key words or a brief description*

18. What are some criteria or elements that should be used to define a “green space”, in your opinion? Please provide key words or a brief description*

19. What are some criteria or elements that should be used to define a “blue space”, in your opinion? Please provide key words or a brief description*

20. Provide examples of types of areas that could be urban PAs, OECMs, and/or green and blue spaces in your country, based on the criteria or elements you described above*

21. Share a case study of an urban nature area in your country (it could be a PA, OECM, or other green/blue space/designated area)*

Include details of as many of the following as possible:

- Name of the site, if applicable
- Location (city, country, support with a map in the next question if possible)
- Main purpose of the area (e.g. recreation, exercise, conservation, etc.)

- If the area is a PA, OECM, or other green/blue space, and any particular national or global designation (e.g. local conservation area, city park, etc.)
- Description (support with an image in the next question if possible), including the type of area it is (terrestrial, freshwater/wetland, coastal/marine)
- Management body
- Governance body or bodies (including if it is private, government, or shared governance)
- Urban pressures faced in the site (e.g. pollution, encroachment, invasive alien species, ornamental non-native plants, land-use conversion)

22. Please upload supporting files for your case study. If there are any issues with this, you can email them to wcpa.mitalisharma@gmail.com

23. How can existing urban nature areas (PAs, OECMs, green and blue spaces) be enhanced (e.g. by adding more native vegetation)?*

24. Does your country have specific categories for urban PAs/OECMs/green and blue spaces?*
Yes
No
Not sure

25. If so, please describe how they are defined/categorised, including any criteria

26. Does your country, state, or city have policies aimed at developing urban nature areas (PAs, OECMs, and/or green/blue spaces etc.)? *
Yes
No
Not sure

27. If so, please describe these

28. Would you like to be acknowledged as a survey responder in the Appendix of the paper (applies if you have answered all the applicable questions)?*
Yes
No

Appendix C. Survey respondents who consented to acknowledgment

Name	Position and affiliation	City and country
Ak Mohd Rafiq Ak Matusin	Senior lecturer, Universiti Teknologi Malaysia	Johor Bahru, Malaysia
Anushri Tiwari	South Asia Region Lead, Urban Biodiversity Hub	Ahmedabad, India
Asri A. Dwiyahreni	Senior researcher	Jakarta, Indonesia
Cynthia Chin	Head of Conservation (Sarawak), WWF-Malaysia	Kuching, Malaysia
Gabriel Victor Caballero	Director, CALAHE Environmental Consultancy Services	General Tinio, Nueva Ecija, Philippines
Juvie E. Reyes	Environmental Management Specialist II-Local Government Unit San Pablo City	San Pablo City Philippines
Kelvin Anthony Balaquit	Ecosystems Management Specialist II	Manila City, Philippines
M. Rafee Majid	Professor, Universiti Teknologi Malaysia	Johor Bahru, Malaysia
Mansor Mohamad	Director General, National Landscape Department Of Malaysia	Malaysia
Md. Sharifuzzaman	Wildlife and Biodiversity Conservation Officer, Ministry of Environment, Forest and Climate Change, Bangladesh	Dhaka, Bangladesh
Mohamed bin Hitam	Senior Project Manager	Kuala Lumpur, Malaysia
Pakarat Phengsawat	Environmentalist	Thailand
Nadzirah Hosen	Senior Lecturer, Department of Urban and Regional Planning, Faculty of Built Environment and Surveying, Universiti Teknologi Malaysia	Johor Bahru, Malaysia
Naventhan	Programme Manager	Penang, Malaysia
Pasut To-ying	Communication team leader, GYBN Thailand	Bangkok, Thailand
Rajiv Kangabam	Lead, Manipur Technology Innovation Hub	Imphal, India
Serge Morand	DR CNRS, Mahidol University	Bangkok, Thailand
Sharlini binti Speri	Town Planner	Terengganu, Malaysia
Stevie Leonard Harison	Founder, Inspirator Muda Nusantara (Inspiring Youth of the Indonesian Archipelago)	Bandung, Indonesia
Surin Suksuwan	Biodiversity consultant	Kuala Lumpur, Malaysia
Suuhas Tenddulkar	Program Director, Environmental Resources Foundation	Goa, India
Utain Pummarin	Director of Nature Play and Learn Club	Thailand
Valentine Datu	Environment Management Specialist I - LGU-Balanga City	Balanga City, Philippines
William Chavez	Private	Caloocan City, Philippines
Yiyun Sun	Programme Officer, IUCN China	Beijing, China

Appendix D. Survey methodology and results

An open-source web-based document tagging tool for qualitative data analysis called Taguette was used to support the categorisation of open-ended survey responses, and based on this, to see which elements survey respondents mentioned frequently and found relevant. Most related terms were coded into one overarching term to use in the definitions, and some were kept separate to have more nuance in the criteria (e.g., “waterbody or watercourse”, “inland water”, and “coastal or marine” were all included even though they overlap). Each term was only counted once per survey response when the frequency was assessed (i.e., if “vegetation” was mentioned twice in one response, it was only counted once).

If a term was not very frequently mentioned but was deemed important based on the objectives of this project, it was included as well. To keep the definitions from becoming overly limiting, not all the frequently-mentioned terms mentioned for green and blue spaces were included, since green and blue spaces are meant to be more widely encompassing than PAs and OECMs, as per global consensus and in alignment with the objectives of this paper. However, these terms were added under Section 5 as a way to improve these areas.

Along with the qualitative open-ended questions, the survey also included three multiple choice (“yes”, “no”, or “maybe”) questions of images of potential green spaces, and three for potential blue spaces, to cross-check the descriptors and terms mentioned. Based on these responses, other considerations were included in the working definition and criteria. Additional considerations were also added for alignment with global targets.

Green space:

Table D1 shows categorised and related terms that were mentioned by at least two respondents for the survey question related to the criteria for "green space", ordered from most to least frequently mentioned; many of these were then included in the working definition. Based on the results of the multiple-choice questions of the images (see "Quantitative results" below), other considerations were included in the working definition and criteria, such as "private" and "vertical" to refer to rooftop gardens in private buildings, and other related spaces, as well as descriptors of spaces that will not qualify.

Table D1. Categorised terms from the survey responses for green space criteria. Frequency refers to how many survey respondents, out of a total of 32, mentioned these terms, or related terms, in their responses. Terms mentioned by at least two respondents are included. Ordered from highest to lowest frequency.

Categorised terms	Related terms and phrases	Frequency
Vegetation	Plants; trees; grass; elements of nature	18/32 (56.3%)
Human well-being	Recreation; leisure; enjoyment; community bonding; used by people for various daily activities	10/32 (31.3%)
Open	Outdoor	8/32 (25%)
Substantial coverage (for vegetation)	Mass of; covered by; almost totally dominated by; sufficient; high	7/32 (21.9%)
Natural		6/32 (18.8%)
Public access	Accessibility	6/32 (18.8%)
Biodiversity considerations	Biodiversity; conservation; diversity of flora and fauna	4/32 (12.5%)
Semi-natural or man-made	Green rooftop; urban farm	4/32 (12.5%)
Sizeable	Ample; proper size; scale	4/32 (12.5%)
Wildlife	Animals enjoying the space; species thriving; shareable space with wildlife	4/32 (12.5%)
Ecosystem services	Ecological services	3/32 (9.4%)
Native	Indigenous; endemic; removal of non-natives; no ornamental plants	3/32 (9.4%)
Private access	Green rooftop; urban farm	2/32 (6.25%)
Vertical	Green rooftop	2/32 (6.25%)

Blue space

Table D2 shows categorised and related terms that were mentioned by at least two respondents for the survey question related to the criteria for "blue space", ordered from most to least frequently mentioned; many of these were then included in the working definition. Since GBF Target 12 only mentions "coastal" and not "marine", this was reflected in the categorisation accordingly. Based on the results of the multiple-choice questions of the images (see "Quantitative results" below), other considerations were included in the working definition and criteria, as well as descriptors of spaces that will not qualify.

Table D2. Categorised terms from the survey responses for blue space criteria. Frequency refers to how many survey respondents, out of a total of 32, mentioned these terms, or related terms, in their responses. Terms mentioned by at least two respondents are included. Ordered from highest to lowest frequency.

Categorised terms	Related terms and phrases	Frequency
Waterbody or watercourse	Body of water; water features; water; surface waters; water presence; primarily made of water; river; pond; waterfall; wetland; lake; stream; canal; sea; ocean	24/32 (75%)
Inland water	River; pond; waterfall; wetland; lake; stream; canal	11/32 (34.4%)
Coastal	Sea; ocean	8/32 (25%)
Human well-being	Enjoyment; recreation; rest	7/32 (21.9%)
Sizeable	Large enough; space; proper size	7/32 (21.9%)
Natural		6/32 (18.8%)
Public access	Accessible to people	5/32 (15.6%)
Semi-natural or man-made	Aquafarms	5/32 (15.6%)
Connected to landscapes	Connectivity; presence of vegetation nearby; interacts with the landscape/soil directly; ground infiltration function	4/32 (12.5%)
Open	Outdoor	4/32 (12.5%)
Wildlife	Animals enjoying the space; home for animal species; supporting species	4/32 (12.5%)
Considerations for biodiversity and ecosystems	Functional ecosystem; biodiversity friendly; biodiversity conservation	3/32 (9.4%)
Ecosystem services	Flood control; ecological services	3/32 (9.4%)
Unpolluted	Clean	2/32 (6.25%)

Urban area

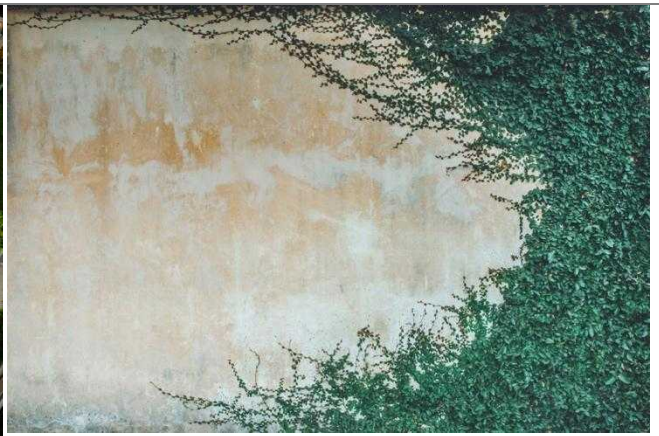
Table D3 shows categorised and related terms that were mentioned by at least two respondents for the survey question related to the criteria for "urban area", ordered from most to least frequently mentioned; many of these were then included in the working definition.

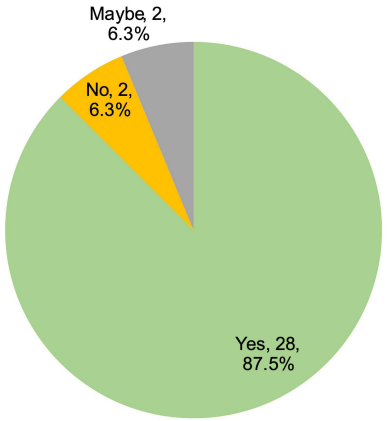
Table D3. Categorised terms from the survey responses for urban area criteria. Frequency refers to how many survey respondents, out of a total of 32, mentioned these terms, or related terms, in their responses. Terms mentioned by at least two respondents are included. Ordered from highest to lowest frequency.

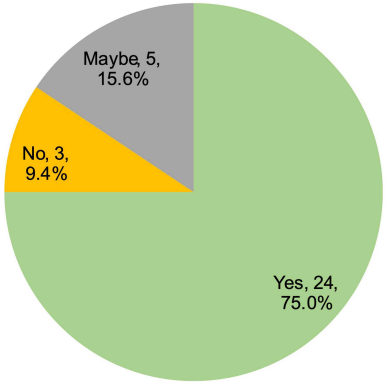
Categorised terms	Related terms and phrases	Frequency
High population density	Densely populated; high human settlement; population; density; specific number of population	16/32 (50%)
Infrastructure and facilities	Roads; bridges; railways; transportation system; pavements	13/32 (40.6%)
Buildings	High rises	9/32 (28.1%)
Developed	Development	7/32 (21.9%)
Planned land-use	Allocation of land use; land-use plans; uses	7/32 (21.9%)
Built environment	Built-up area; built-up environment	6/32 (18.8%)
City	Cities	6/32 (18.8%)
Human settlement	Habitation of human communities; human structures, such as houses; settlement	5/32 (15.6%)
Commercial and industrial establishments	Establishment with at least 100 employees, and/or 5 or more establishments with at least 10 employees; commercial buildings; mall	4/32 (12.5%)
Economic activities and systems	Systems for the economy; economic distribution; economic activities	3/32 (9.4%)
Modern	Modernization	2/32 (6.3%)
Suburban		2/32 (6.3%)
Town	Towns	2/32 (6.3%)

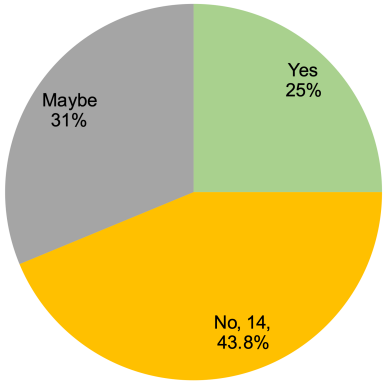
Quantitative results

“Do you consider this to be a green space?”; options: Yes, No, or Maybe

Image 1	**Image 2**	**Image 3**
		

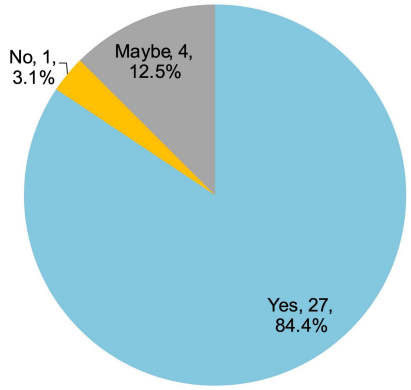

Maybe, 2,
6.3%
No, 2,
6.3%
Yes, 28,
87.5%

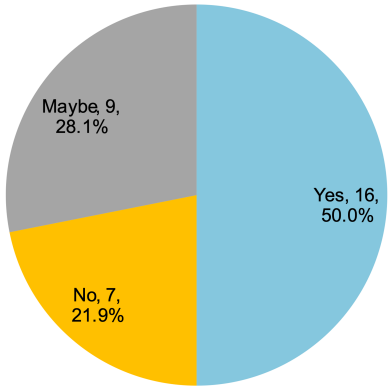

Maybe, 5,
15.6%
No, 3,
9.4%
Yes, 24,
75.0%

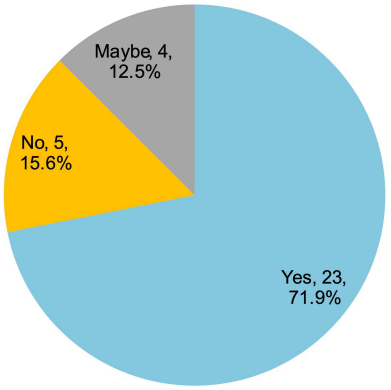

Yes
25%
Maybe
31%
No, 14,
43.8%

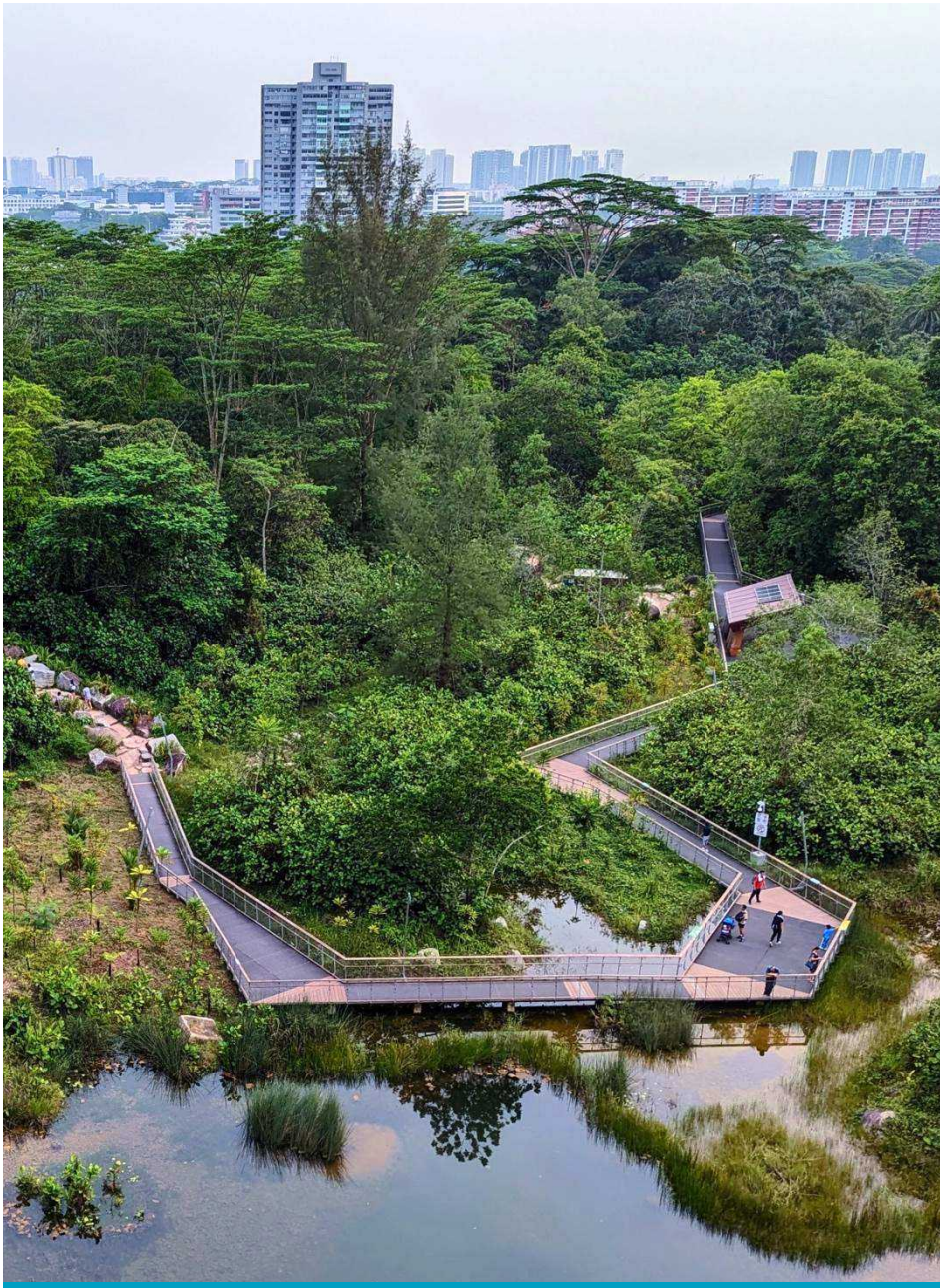
“Do you consider this to be a blue space?”; options: Yes, No, or Maybe

Image 1	Image 2	Image 3
		


No, 1, 3.1%
Maybe, 4, 12.5%
Yes, 27, 84.4%


Maybe, 9, 28.1%
Yes, 16, 50.0%
No, 7, 21.9%


Maybe, 4, 12.5%
No, 5, 15.6%
Yes, 23, 71.9%



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