MARCH 2024

UNLOCKING
THE POTENTIAL OF NATURE IN CLIMATE ACTION PLANNING

A REPORT ON HONG KONG'S NATURE-BASED SOLUTIONS

The Nature Conservancy 大自然保護協會
思匯 CIVIC EXCHANGE
HONG KONG 2050 IS NOW

Unlocking The Ponential Of Nature In Climate Action and Planning:
A report on Hong Kong's Nature-based Solutions

Date of publishing: March 2024
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The report is funded by The Nature Conservancy and jointly prepared by Kitty Tam and Harriet Tsang from Civic Exchange, Felix Leung and Marine Thomas from The Nature Conservancy with comments from David Dudgeon, Billy Hau, Juan Diego Gaitan-Espitia, Patrick Yeung, Carmen Or, Kelly Dai and Robert Gibson.

We gratefully acknowledge the generous support of J.P. Morgan and HKEX Foundation Limited, which has made the production of this report possible.

The report was designed by Michael Kozlarek and Lauryn Wachs.

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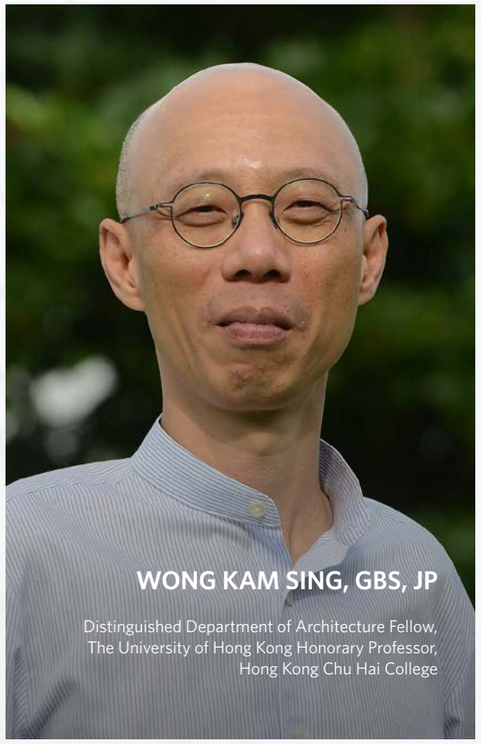
Foreword

As the former Secretary for the Environment of Hong Kong SAR Government, although I am no longer in a position to endorse the specific recommendations of this report, I support the idea that Hong Kong, including both the public and private sectors, should consider integrating the potential of Nature-based Solutions (NbS) when updating climate and sustainable development action plans.



WONG KAM SING, GBS, JP

Distinguished Department of Architecture Fellow,
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Our national government is proactively promoting ecological conservation. Hosting the 15th Conference of the Parties to the United Nations Convention on Biological Diversity (COP 15) and advocating for the adoption of the Kunming-Montreal Global Biodiversity Framework are just a few recent examples. As part of China's commitment to international nature conservation and NbS initiatives, our national government has:

- collaborated with the IUCN to publish "Towards Nature-based Solutions at scale: 10 case studies from China"; and
- established the Nature-based Solutions Asian Hub.

NbS offers a comprehensive approach that can help optimise economic, social, and environmental benefits.
By harnessing the natural environment, NbS can help us tackle climate adaptation and mitigation challenges while enhancing biodiversity and human well-being.

Considering the current economic challenges, NbS can help bring additional economic benefits to our city. The IUCN Global Standard for NbS includes economic feasibility as a crucial criterion, emphasising the need for an NbS to be affordable.

For instance, the Drainage Services Department's work on Blue-Green Infrastructure (BGI) serves as a good example towards NbS action in Hong Kong.

New development areas, including the Northern Metropolis, have great potential to integrate NbS in their planning and design stages as well.

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This report offers information, ideas, and insights for policymakers and stakeholders alike. It aims to stimulate further discussions and action to create a more sustainable future for Hong Kong. My hope is that Hong Kong can be a smarter and more innovative climate hub, setting an international and regional example for climate action.

As demonstrated in the Hong Kong Environmental Report 2012-2022, we have to be interactive and innovative when implementing and updating climate action plans and environmental blueprints to strengthen climate adaptation and achieve carbon neutrality before 2050.

Executive Summary

This report provides an overview of the interconnected challenges of climate change and biodiversity loss and explores the potential of nature-based solutions (NbS) to address these issues. It highlights the limitations of current actions taken since the 1992 Rio Earth Summit and examines the implications of the 2015 Paris Agreement.

Additionally, it summarizes the key findings from the 'NbS for Climate Forum' held in October 2023, which showcased NbS initiatives in Hong Kong and the Greater Bay Area (GBA).

The challenges of climate change and biodiversity loss are intrinsically linked, as recognized by the 1992 Rio Earth Summit's Framework Convention of Climate Change (UNFCCC)[1] and Convention on Biodiversity (CBD)[2]. Despite this recognition, progress in addressing these challenges has been inadequate.

The 2015 Paris Agreement[3] set targets to limit the global average temperature increase to well below 2°C above pre-industrial levels, with efforts to achieve a 1.5°C increase.

However, the UN Environment Programme's Emissions Gap Report 2023[4] highlights substantial greenhouse gas emissions since the agreement, making it increasingly challenging to meet the 1.5°C target and casting doubt on the feasibility of keeping the increase below 2.0°C.

A pathway with a 66% chance of staying below 2°C of warming this this century requires a 28% cut by 2030 and 37% cut by 2035.

Nature-based Solutions (NbS) offer a promising approach to combat climate change while promoting biodiversity and human well-being. The 'NbS for Climate Forum' held in October 2023 showcased NbS initiatives in Hong Kong and the GBA, demonstrating their effectiveness in addressing climate change and biodiversity loss.

Key findings from the forum held in October 2023 include the importance of restoration projects, such as wetland restoration and reforestation, which provide carbon sequestration, improve cliamte resilience, and enhance urban biodiversity. The restoration of degraded ecosystems, such as oyster reefs and mangroves, was also discussed as a means to enhance coastal resilience and sequester carbon.

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ROADMAP TO A CLIMATE RESILIENT & NATURE POSITIVE HONG KONG

Short-term action

1. Raise awareness on the potential benefits of NbS and build support for NbS implementation
2. Prevent ecosystem degradation that releases carbon into the atmosphere or reduces climate resilience.
3. Allocate funding for NbS projects and encourage nature-related financial disclosure
4. Promote a co-design, co-creation, and co-management approach to NbS
5. Include NbS in the Hong Kong Biodiversity Strategic Action Plan and establish a task force for NbS

Medium-term action

1. Apply the IUCN Global Standard for NbS
2. Mainstream NbS into decision-making, climate policy and urban planning processes
3. Create a comprehensive and adaptive monitoring and evaluation plan
4. Include NbS in the management of protected areas and restore Hong Kong's degraded ecosystems

Long-term action

1. Develop a 50-year vision
2. Carry out landscape-level intervention
3. Pursue the Ramsar Wetland City accreditation for Northern Metropolis

Introduction

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THE INTERCONNECTEDNESS OF CLIMATE, NATURE AND HUMAN SOCIETY

In 2023, the world experienced its hottest year on record. According to the World Meteorological Organization, an analysis of six global temperature datasets revealed that the global average temperature had risen by 1.45°C compared to pre-Industrial Revolution levels.[5]

Climate models show that for the past 3 million years, the Earth hasn't warmed more than 2°C above the pre-industrial global average temperature.[6]

This stable climate has been crucial for the development and growth of human populations. Nature has helped by absorbing carbon dioxide, controlling moisture, and affecting how much sunlight is reflected.

But human activities have upset this balance. Since the Industrial Revolution, about

550 gigatonnes

of carbon emissions have been released, with 280 gigatonnes added to the atmosphere.

Agriculture, with deforestation at its forefront, is the biggest source of greenhouse gas emissions, making up about 25%.[7]

It's clear that current greenhouse gas emissions are not sustainable. To prevent more damage, the Intergovernmental Panel on Climate Change (IPCC) calls for rapid, sustained, and deep cuts in emissions, as well as faster adaptation.[8] Alongside cutting emissions, nature can help by absorbing excess carbon and lessening the impact of these gases.

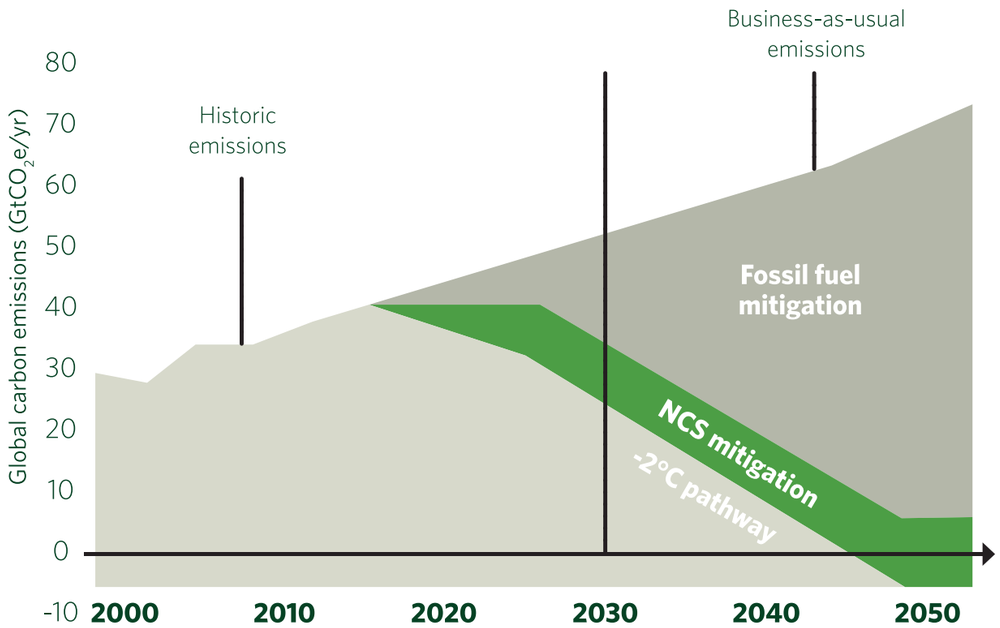
Regreening the planet and protecting intact natural systems, like forests, can reduce short-term carbon emissions by 37%, meeting the 2030 climate goals of the Paris Agreement.[9]

Conserving, restoring, and sustainably managing nature, along with immediate reductions in fossil fuel use and further cuts after 2030, is a key pathway to carbon neutrality by 2050. This holistic approach not only addresses rising temperatures but also leads to a sustainable and resilient future.

A 2017 study by The Nature Conservancy (TNC) found that nature can help achieve up to one third of the cost-effective mitigation needed by 2030 to limit global warming to below 2°C. These efforts can also support biodiversity and advance the United Nations Sustainable Development Goals (SDGs).

The study refers to these strategies as Natural Climate Solutions (NCS), which focus on carbon sequestration and climate mitigation. NCS involve protecting, managing, and restoring natural and working systems to avoid greenhouse gas emissions and/or enhance carbon sequestration in ecosystems like forests, wetlands, grasslands, and agricultural lands.

NATURAL CLIMATE SOLUTIONS CONTRIBUTION TO STABILIZING WARMING BELOW 2°C



However, the potential for NCS to succeed is expected to decrease after 2030, and this decline will be even more pronounced after 2050.

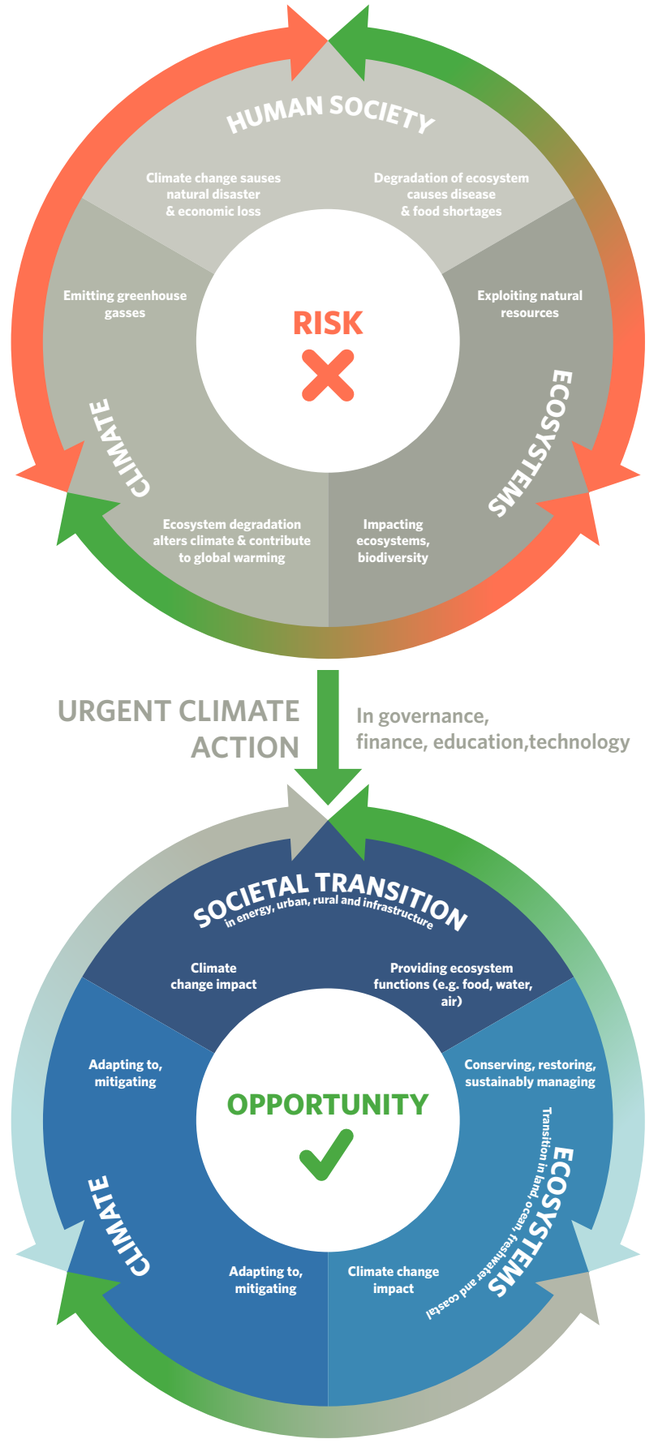
This projection is based on two main reasons:

1. Climate change feedback will gradually weaken ecosystems' resilience, reducing their ability to sequester and store carbon.

2. If emissions continue to rise under business-as-usual scenarios, the relative impact of NCS will diminish.

Given that Hong Kong's Northern Metropolis is scheduled to be completed in 2030, it is urgent to implement NbS and NCS in the early planning stages to maximise the efficiency of using nature to sequester carbon and help Hong Kong achieve its carbon neutrality goal by 2050.

THE RISK AND OPPORTUNITIES ARISE FROM THE INTERCONNECTEDNESS OF CLIMATE, ECOSYSTEMS AND HUMAN SOCIETY.



ACCELERATING CLIMATE RISKS

The 2023 IPCC Sixth Assessment Report warns that climate risks are increasing faster than expected.[10]

The World Economic Forum Global Risks Report 2024 also highlights how environmental risks, such as extreme weather and biodiversity loss, are escalating.[11]

It's crucial to keep global warming below 1.5°C to avoid severe impacts.[12] At 1.5°C, areas like Africa and Asia will face more heavy rain and flooding, along with less permafrost and ice. At 2°C, many regions will see more extreme heatwaves and droughts, with extreme heat exceeding the critical thresholds for health and agriculture.[13]

As we approach 1.5°C, adapting to climate risks becomes harder, especially in regions with limited capacity. Meeting mitigation targets is essential for ecosystem recovery.

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A VISION FOR A CLIMATE RESILIENT FUTURE

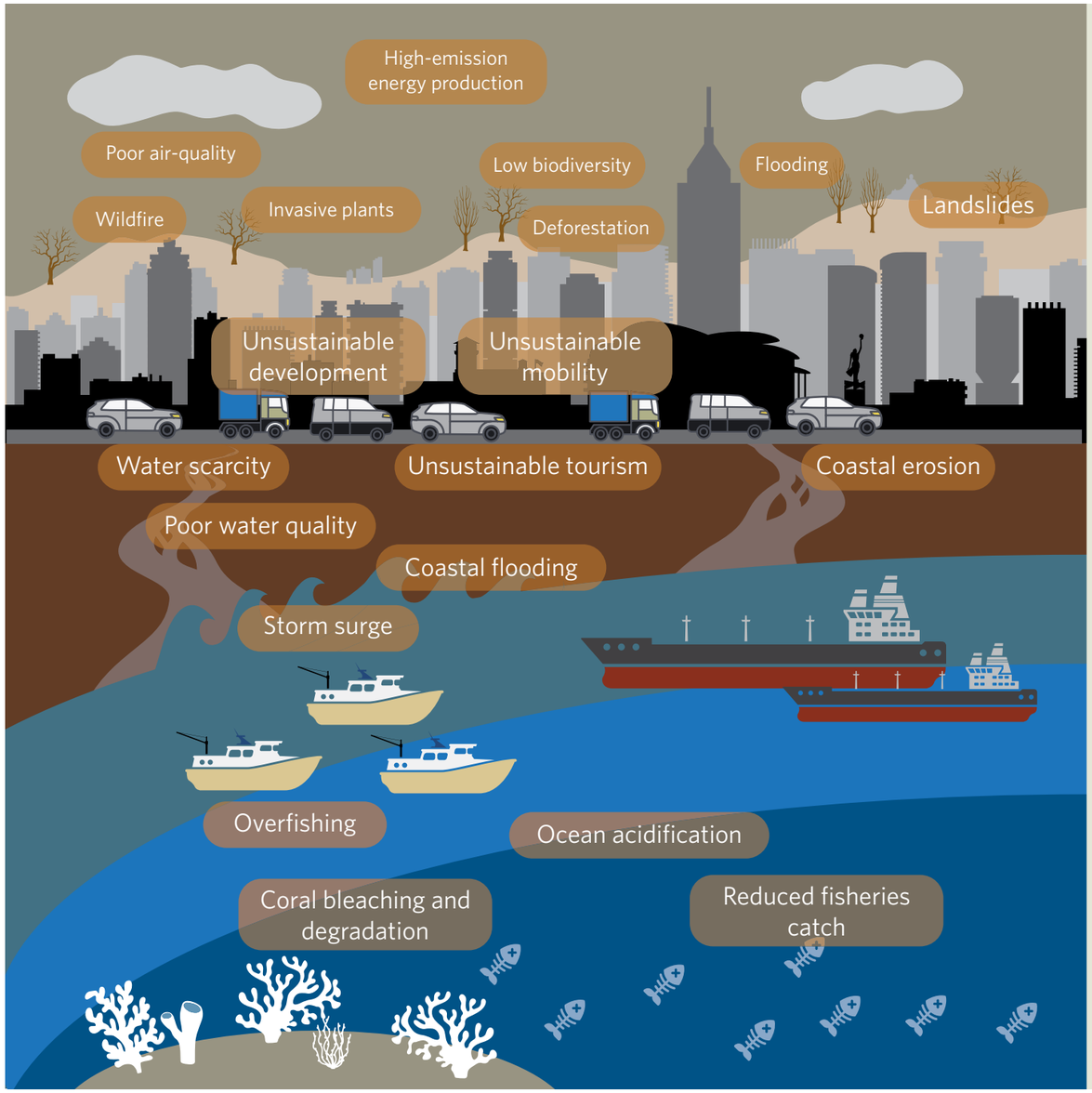
There is a vital need to protect the natural world—our biosphere—for the sake of biodiversity, human well-being, and sustainable development.

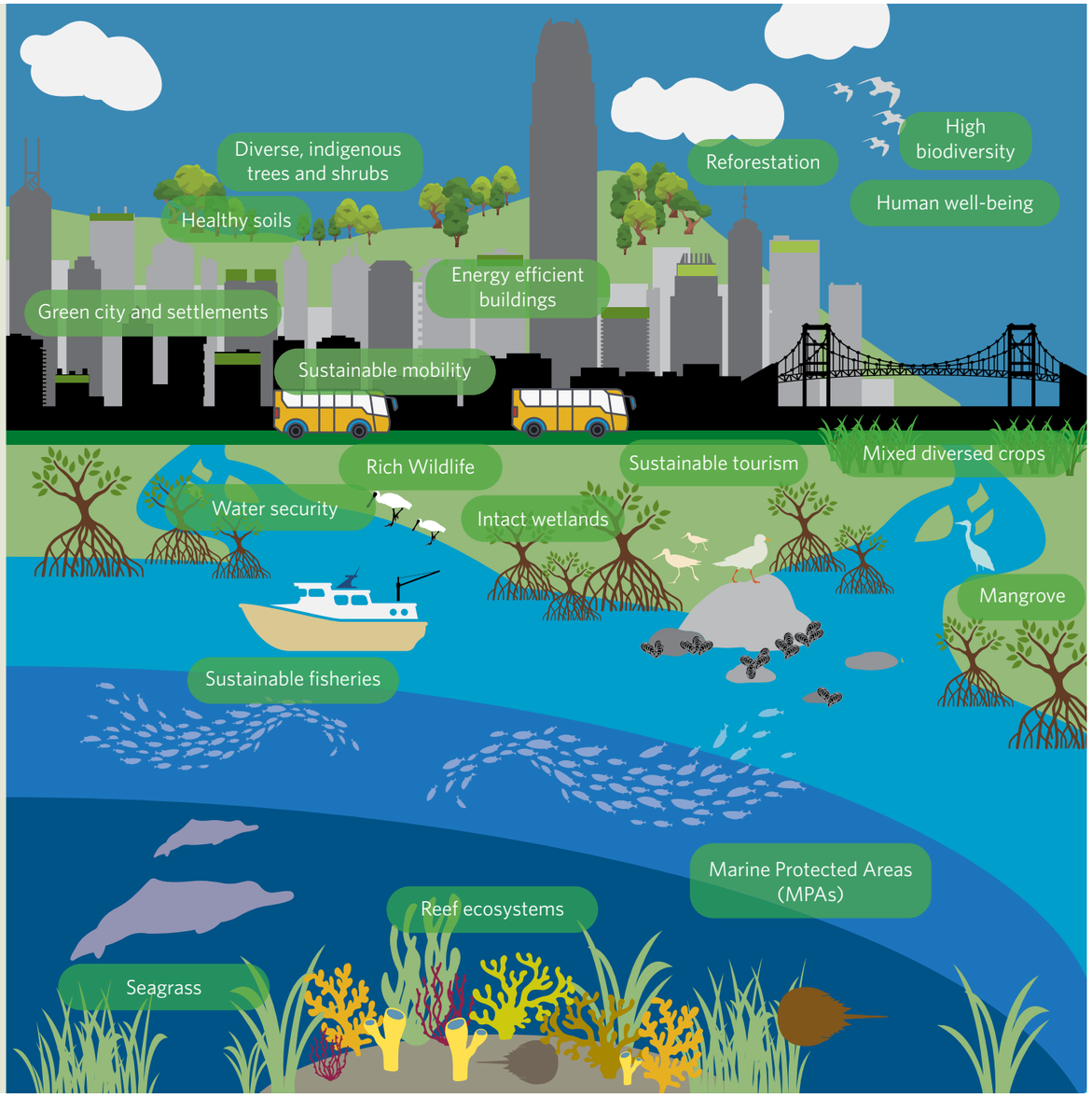
Harmful practices that exploit and degrade the environment have negative impacts on both people and nature.

We need strategies that include adapting to climate change, reducing environmental impact, and responsibly managing ecosystems.

By choosing to value and protect nature, we can build a more resilient and sustainable future where both people and nature can thrive together.

DIFFERENCE BETWEEN AN ECOSYSTEM APPLIED WITH NBS AND A DEGRADED ECOSYSTEM





"Let's look at the big picture. Which future are you rooting for? The one on the left, where we take nature for granted and overexploit all its resources, or the one on the right, where we conserve and restore nature and benefit from all its resources?"

Ms. Kitty Tam

"Our climate is changing and whether we live in a city or a rural area, we will need to make some changes in order to adapt. We have an option to make protecting and restoring nature one of these changes; allowing us to lead lives less-impacted by climate change and enriched by the nature around us."

Edward Game

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What are Nature-based Solutions?

Nature-based Solutions are *"actions to protect, sustainably manage and restore natural and modified ecosystems in ways that address societal challenges effectively and adaptively, to provide both human well-being and biodiversity benefits."*

(IUCN, 2016)[14]

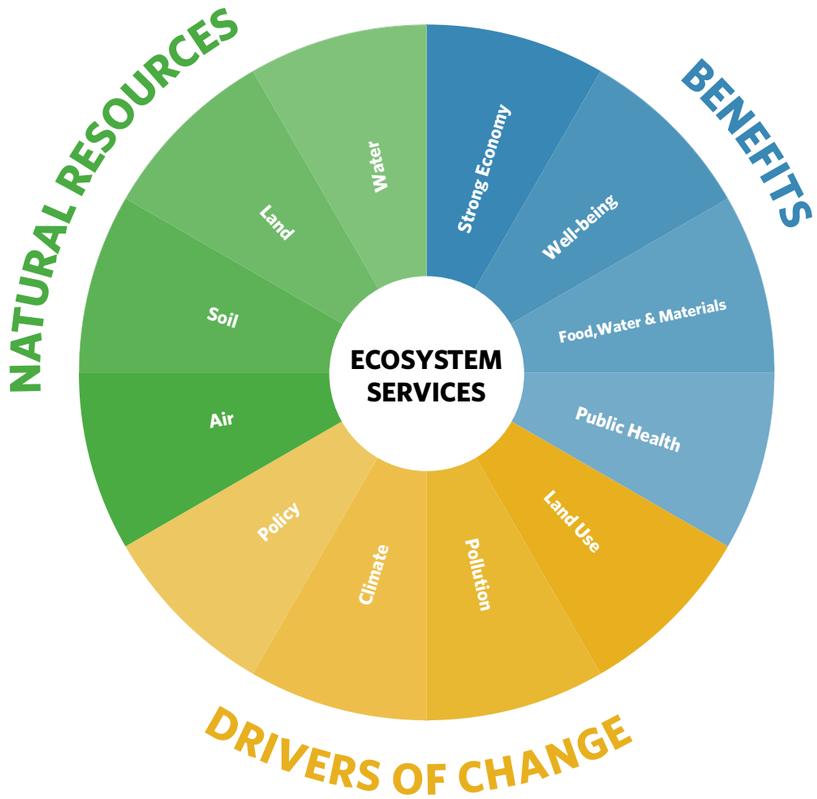
"Nature-based Solutions are not just about biodiversity; they are about addressing the needs of people."

Dr Vincent Cheng

ECOSYSTEM FUNCTIONS

Nature plays a crucial role in providing essential ecosystem functions, regulating the climate, supplying valuable resources such as clean water and fresh air, and acting as a carbon sink.

These resources contribute significantly to various aspects of human society, including overall well-being and economic prosperity.



HISTORY OF NATURE-BASED SOLUTIONS

The concept of NbS has evolved over time, from merely recognising the importance of ecosystem functions to the development of the concept of natural capital to the current NbS approach.[15, 16]

COP15, Adoption of the Kunming Montreal Framework, December 2022
Photo by IISD / Mike Muzurakis

1970s The idea of environmental or ecosystem services began to establish itself in the modern scientific literature

1990s It was generally realised that a more systematic approach was required to document and understand the relationship between people and nature

1995 Convention on Biological Diversity endorsed and adopted the Ecosystem Approach

2000s The concept of NbS was introduced by the World Bank and the International Union for Conservation of Nature (IUCN).

2005 The Millennium Ecosystem Assessment offered a robust evidence base, encompassing the next 50 years, to reverse the degradation of many ecosystem services by suggesting changes in policy and practices in restoration, conservation, and sustainable management of nature.

2009 IUCN actively promoted the NbS concept in its position paper at the United Nations Framework Convention on Climate Change (UNFCCC) COP 15

2015 The European Commission integrated the NbS concept into its research program.

2019 NbS gained endorsements in key reports, including the Climate Change and Land Report of the IPCC.

2022 NbS is incorporated into the targets of the United Nations Convention on Biological Diversity COP15 agreement, known as the 'Kunming-Montreal Global Biodiversity Framework'.

DIFFERENCE BETWEEN NATURE-BASED SOLUTIONS AND CONSERVATION

Conservation and NbS are closely connected concepts that address environmental issues.

The IUCN recognises two main types of conservation[17]: one focused on protecting biodiversity for its own sake, and the other aimed at benefiting society, known as NbS.

While both follow the same conservation principles, they differ in their main goals, though there can be overlap in practice. NbS involves many conservation actions that benefit society, but not all conservation efforts are NbS.

"NbS isn't a conservation trend. It is conservation in action or applied conservation."

Ms. Kitty Tam

DIFFERENCE BETWEEN BLUE-GREEN INFRASTRUCTURE AND NATURE-BASED SOLUTIONS

Blue-green infrastructure (BGI) is a city planning approach that tackles water-related issues by using urban green spaces and natural water flows.[18]

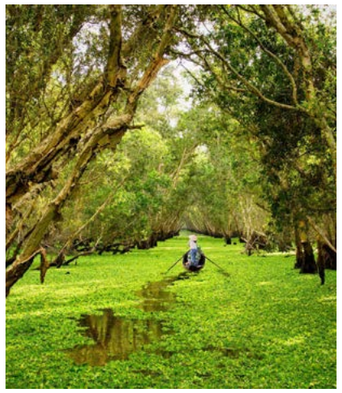
The BGI process falls under the umbrella of NbS, which focuses on using biodiversity to solve global problems, a key aspect not always present in BGI planning.[19]

"Integrating blue-green infrastructure is crucial for the success of nature-based initiatives in urban development."

Ir Dr Vincent Cheng

Concept	Blue Green Infrastructure (BGI)	Nature-based Solutions (NbS)
Origin	The concept of BGI originates from the need to manage urban sprawl, create ecological networks, and address stormwater concerns by including planned blue and green spaces and environmental features in urban planning.	NbS started to help with climate change but now focuses on biodiversity, urban nature projects, and other environmental issues.
Relationship	BGI is a component of NbS but represents a specific subset of these solutions.	NbS encompasses BGI along with other measures that address various urban challenges.
Current focus	Broad socio-ecological focus, with major role for landscape architecture and landscape ecology.	Multiple societal challenges; biodiversity seen as central to solution.
Purpose	Enhances urban resilience and sustainability by providing ecosystem services such as improved air quality and reduced urban heat.	Addresses multiple urban challenges, including climate change adaptation, biodiversity conservation, and sustainable development.
Examples	Urban forests, green roofs, wetland restoration, permeable pavements, and green corridors.	BGI, green roofs, wetland restoration, urban agriculture, agroforestry, riparian buffer zones, urban green spaces and coastal restoration.
Integration in Urban Planning	BGI is a strategic planning method, systematically incorporated into urban development at different scales.	NbS utilises urban planning tools, with BGI serving as a strategic component in the overall approach.
Emphasis on Biodiversity	May or may not emphasise biodiversity, depending on the specific goals of the green infrastructure project.	Places a strong emphasis on the role of biodiversity in developing solutions to challenges.
Application in planning practice	Very well-established.	Still needs to be developed but has a strong action focus on problem solving.
Collaboration and Integration	Requires collaboration between urban planners, environmentalists, and communities to integrate green features into urban plans.	Encourages collaboration across sectors, integrating various nature-based approaches and stakeholders to address diverse urban challenges.

DIFFERENCE BETWEEN NBS, NATURE-DERIVED SOLUTIONS AND NATURE-INSPIRED SOLUTIONS



Nature-based Solutions

Nature-based Solutions leverage the power of functioning ecosystems as infrastructure to provide natural services.

Nature-derived Solutions

Nature-derived Solutions encompass wind, wave, and solar energy, all derived from natural resources.

Nature-inspired Solutions

Nature-inspired solutions involve the innovative design and production modelled after biological processes.

NbS uses functioning ecosystems to provide services for society and the environment.

Nature-derived solutions come from nature, like wind and solar energy, for low-carbon needs.

Nature-inspired solutions copy nature to solve human problems, like the Shinkansen train in Japan, which is inspired by kingfishers' beaks to reduce noise and drag.

Both types of solutions are crucial for a sustainable future but don't depend directly on ecosystems.[20]

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THE IUCN GLOBAL STANDARD FOR NATURE-BASED SOLUTIONS™

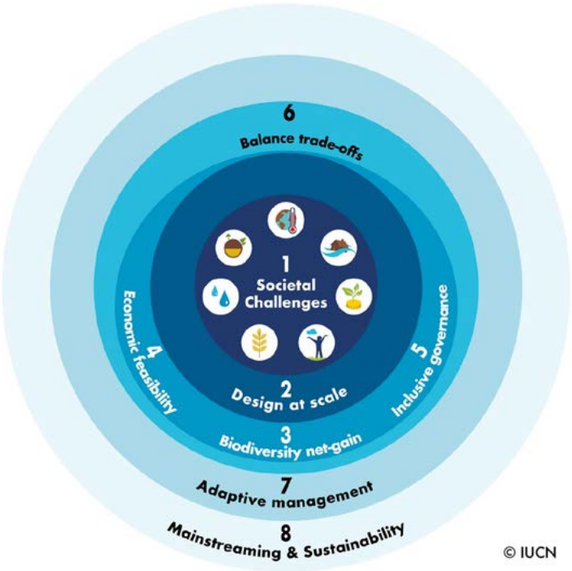
The IUCN Global Standard for NbS™ (the Standard) and its related guidance were released in 2020. It provides a framework with 8 criteria and 28 indicators for planning and implementing NbS interventions.[21]

Criterion 1 is about the importance of identifying and addressing societal challenges through NbS. Criterion 2 mentions how design and planning should consider the scale.

Criteria 3, 4, and 5 make sure NbS follows the principles of sustainable development, focusing on environmental sustainability, social equity, and economic viability.

Criterion 6 highlights trade-offs to think about in NbS interventions between short-term and long-term benefits.

Criterion 7 emphasises adaptive management, and Criterion 8 stresses NbS should be mainstreamed and integrated into various practices.



"Not all NbS projects need to meet all IUCN criteria at the starting stage to be economically viable. But all NbS project proponents must go through IUCN Global Standard step by step seriously."

Ms. Kitty Tam

NATURE-BASED SOLUTIONS EXAMPLES

Landscape restoration and agroforestry in Rwanda's forest ecosystem

© Fiona Windsor

Rwanda's reforestation and agroforestry initiative, in collaboration with the IUCN, changed how land is used, stopping erosion, soil loss, and resource strain from farming and urban growth.

The initiative tackles issues like land damage, food and water safety, and landslides.

Since 2011, it restored over 700,000 hectares of land, sequestering around 100 million tonnes of CO2.

It also created 22,325 jobs and matched farmers' needs with tree planting. Rwanda's government improved agency teamwork and mandates too.[22,23]

Mangrove sustainable management in Viet Nam's coastal ecosystem

© Tuan Nguyen Tan

The Mangroves and Markets project in Cà Mau, Vietnam, aims to protect mangroves and help shrimp farmers.

Over 5,000 farmers have been trained to farm shrimp sustainably and have promised to keep at least half of their land covered in mangroves.

Mangrove forests in Cà Mau shield communities from natural disasters and produce organic shrimp.

Some farmers have earned organic certification and increased their income by up to 10%.

This effort has helped manage 15,000 hectares of mangrove forest sustainably, benefiting locals and wildlife.[24]

Seagrass restoration in Chesapeake Bay, Virginia, USA

Almost one hundred years ago, a widespread disease killed 90% of Atlantic basin eelgrass on the shores of both America and Europe.

Seagrass beds in and near the Chesapeake Bay were all affected. Since 2008, Chesapeake Bay been the focus of extensive seagrass restoration efforts led by TNC and partners including the Virginia Institute of Marine Science since 2008.

To date, 9,500 acres of seagrass habitat have been restored.

In recent years, strengthened by strict scientific methodology and measurements, an effort was mounted to translate the carbon mitigation of this ecosystem into a carbon credit commodity with Verra, a global organization that develops and manages standards to verify carbon mitigation, as the gatekeeper.

By restoring seagrass, the project not only contributes to ecosystem recovery but also generates valuable offsets, contributing to carbon sequestration efforts.

Insurance as a solution to fund NbS: Coral reef insurance policy in Mexico

In 2018, TNC in partnership with the Quintana Roo Government launched the world's first insurance solution to preserve a natural ecosystem. In many coastal regions, coral reefs generate billions of dollars by offering massive employment opportunities, contribute to food security as well as coastal protection against disasters and erosion.

This Coral Reef Insurance scheme is an innovative financial solution that promotes the recovery of local coral reefs in face of devastating disasters. Coral Reef Insurance is parametric insurance devised to preserve coral reefs against hurricanes, whereby the payment is triggered once wind speed reaches 100 knots or higher. While traditional insurance takes longer to pay out, parametric insurance can provide funds quickly as there is no need for damage surveys. This ensures rapid disbursement of funds for restoration activities to deal with reef damage . This insurance policy demonstrates a proactive approach to safeguarding valuable natural resources and mitigating the impact of natural disasters with NbS actions such as restoration. Cutting-edge parametric insurances are increasingly used to cover the inevitable loss and damage due to extreme climate events, supported by advanced monitoring technology and risk modeling and scenario analysis .

The rapid recovery of corals and other important ecosystems is key to the sustainability of the economic value of biodiversity. The world's first coral insurance policy is an inspiring example of such a path-breaking tool.

Watershed conservation of Miyuan reservoir, Beijing, China

In 2023, working with governments, businesses and communities, TNC developed a comprehensive innovative conservation model that improves forest quality in the Miyun Reservoir basin, strengthening the biodiversity protection system, enhancing carbon sequastration and water conservation capacity of the ecosystem, and promoting the value realisation mechanism of ecological products.

This reservoir is an important refuelling site for migratory birds along the East Asia-Australasia Flyway. Critically endangered species, such as the White-naped crane are regular visitors.

The management plan maintains the water level of the reservoir to make sure there is enough shallow water to support bird activities.

Ongoing scientific research and pilot reforestation program also help to establish best management practices to ensure water security and enhanced biodiversity.

© Ka Wai Li/TNC Photo Contest 2017

Nature-based Solutions in policy

Paris Agreement

The Paris Agreement, agreed upon in 2015 during the UN Climate Change Conference (COP21), is a crucial treaty for addressing climate change. It aims to limit the global temperature increase to well below 2°C above pre-industrial levels and ideally to 1.5°C.[25]

Countries must reach peak greenhouse gas emissions by 2025 and reduce them by 43% by 2030 to achieve this. The agreement marks a significant step forward in global efforts to combat climate change by bringing nations together in a binding commitment.[26]

The agreement operates on a five-year cycle, with countries updating their climate action plans, known as Nationally Determined Contributions (NDCs). These plans outline steps to reduce emissions and increase resilience to climate change impacts.

Many countries have included NbS in their NDCs, recognising the importance of ecosystems in both reducing emissions and adapting to climate change.[26]

The agreement emphasises protecting ecosystems, conserving biodiversity, and enhancing resilience. It also highlights the importance of ecosystem integrity, oceans and biodiversity, acknowledging forests as crucial carbon sinks as an example of effective NbS implementation.[28]

The agreement encourages policies to reduce deforestation and enhance forest carbon stocks, as well as strategies for sustainable forest management.

Article 5.2 mentioned countries should use policies and rewards to reduce deforestation and forest degradation. It recognises the importance of conserving forests, managing them sustainably, and increasing carbon stored in forests in developing countries. The Agreement also supports other approaches like combining efforts to reduce emissions and adapt to climate change for better forest management.

The Paris Agreement also reaffirms the importance of appropriately incentivising non-carbon benefits associated with these approaches. These provisions collectively underscore the commitment of the international community to incorporate NbS into the global strategy for climate action.[29]

Kunming-Montreal Global Biodiversity Framework

The Kunming-Montreal Global Biodiversity Framework (KMGBF) is an agreement of the Convention on Biological Diversity. It was signed by 196 parties in December 2022. This framework aims to stop and reverse biodiversity loss by 2030.

It outlines 23 global targets for this goal, with two targets emphasising the role of NbS:

Target 8 aims to reduce the impact of climate change and ocean acidification on biodiversity by using a mix of mitigation, adaptation, and disaster risk reduction measures, including NbS. It focuses on minimising negative impacts and promoting positive outcomes of climate action on biodiversity.

Target 11 focuses on restoring, maintaining, and enhancing nature's contributions to people, such as vital ecosystem functions and services like regulating air, water, and climate, ensuring soil health, pollination, and reducing disease risk. This target also involves using NbS to benefit both humanity and the natural world.

NbS is also seen in Target 2, which aims to restore 30% of degraded terrestrial, inland water, coastal, and marine ecosystems by 2030. This restoration includes forests, wetlands, and other ecosystems to increase overall carbon sink capacity, enhancing biodiversity, ecological integrity, connectivity, and ecosystem functions and services.

Ramsar Convention

During the 14th Meeting of the Conference of the Contracting Parties to the Ramsar Convention on Wetlands hosted by China in November 2022, a resolution was passed emphasising the potential of wetlands as NbS for climate change adaptation and mitigation.

The convention urges countries to maintain or improve the ecological character of wetlands to enhance their ability to help with ecosystem-based climate change adaptation. Additionally, the convention highlights the importance of wetlands in storing carbon, promoting these functions as crucial responses for climate change mitigation.[30]

NATURE-BASED SOLUTIONS APPLICATION IN OVERSEAS POLICY

Examples of NbS related policies in other countries including Canada, Singapore, and Vietnam can all offer insights for Hong Kong.

Canada's clear budget allocation model is relevant due to its similar GDP per capita.[31] Singapore, with its comparable urban land area, provides insights for urban planning.[32] Vietnam's application of NbS in coastal and forest habitats offer lessons for conservation in Hong Kong.

Canada

To achieve the goals of the KMGBF, the 2030 National Biodiversity Strategy is being developed as part of the renewed NBSAP[33].

Provinces like Alberta and Prince Edward Island are aligning their strategies with the 2030 National Biodiversity Strategy, incorporating NbS to address coastal development and forest enhancement.[34] The federal government is emphasising funding for initiatives centered on NbS, such as the Nature Climate Solutions Fund and the 2025 Marine Conservation Targets.[35] Canada's strategy also includes empowering Indigenous communities to pursue their priorities for ecosystem stewardship, with increased funding for Indigenous Protected and Conserved Areas.

This is demonstrated by the $12.8 million investment in 27 Indigenous-led Natural Climate Solutions initiatives[36] and Indigenous-led conservation efforts in the Canada Target 1 Challenge.[37]

Singapore

Singapore's Green Plan 2030 focuses on the concept of "City in Nature," emphasising the importance of preserving and enhancing the island's natural capital.

The National Parks Board (NParks) is actively implementing eco-engineering solutions, like naturalised waterways for flood control, and combining hard and soft engineering to combat coastal erosion.

Singapore is also investing in research, development, and the SG Eco Fund to support projects that tackle climate change and conserve biodiversity.[38]

Vietnam

Vietnam's newest National Adaptation Plan lays out its goals for 2030 to 2050.

The country has also put in place various guidelines, strategies, programs, and plans for conserving biodiversity and managing resources.

For instance, Resolution No. 36-NQ/TW outlines a strategy for sustainable development of the marine economy until 2045[39], and Conclusion No. 56-KL/TW details measures to strengthen natural resource management and environmental protection[40].

Vietnam has been using NbS to restore degraded lands and mitigate climate change.

This includes planting and enhancing mangroves and coastal forests, using flood-based agriculture in the upper Mekong Delta, integrating mangrove-shrimp systems in coastal agro-ecological zones, promoting mixed agroforestry systems[41], and developing green roofs and floating wetlands for water treatment.[42]

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Country	Current Initiatives	Planned Initiatives	Nature-Based Measures/Targets
Canada	**Federal investment to support 27 Indigenous-led Natural Climate Solutions and Natural Climate Solutions Fund** **Provincial initiatives[43]** • Coquitlam storm system • Wetlands Stewardship Agreement, Nova Scotia • Establishment of urban parks in Montreal	**Plant 2 billion trees over next 10 years[44]** **Continued federal support of existing initiatives and funds[45]** • Nature Smart Climate Fund • Marine Conservation Program **Enhanced Nature Legacy**	**2025 Target** • Recognise and support at least 3 ecological corridors between protected and conserved areas[46] **2030 Target[47]** • Restore and revitalise 30% of degraded ecosystems • Ensure 30% of terrestrial, inland water, and marine areas are conserved and managed • Reduce the impact and introduction of invasive alien species by at least 50%
Singapore	**Coastal and mangrove protection and resilience** • Kranji Coastal Park[48] • Sungei Durian mangrove restoration[50] • Low-rock revetments in Pulau Tekong **Restoration and revitalisation of natural waterways in ABC Waters Programme[50]** • Bishan-Ang Mo Kio Park • Jurong Lake Gardens	**Continued coastal protection plans along City-East Coast and North-West Coast** **NParks Species Recovery Programme – 100 plant and 60 animal species by 2030[51]** **Revitalisation of urban parks and development of ecological corridors** • Bukit Batok Nature Corridor • Khatib Nature Corridor[52]	**Target for 2030** • Aim to plant one million more trees by 2030[53] • Restore and enhance 80 hectares of forest, coastal and marine habitats[54] • 300km of ecological corridors between nature parks[55]
Vietnam	**Protecting, restoring and enhancing forests** **Flood mitigation through the development of mangrove sites, seagrass meadows and marshes[57]** • Quang Ngai province • Kien Giang province • Can Gio planting 20,000 hectares of mangrove trees[57]	**Increased efforts of collecting and preserving genetic material of 100,000 flora and fauna** **Enhanced efforts to prevent the degradation of water and land resources and ecosystems via action plans, monitoring systems and increased investments etc** **Promote more climate-resilient agriculture and other smart agricultural solutions**	**2030 Target[58]** • Protected terrestrial areas account for 9% of total land area • Protected sea and coastal areas account for 3-5% of national seawaters • National forest cover maintained at 42-43% • Recover at least 20% of degraded natural ecosystems • Preservation of at least 10 endangered/ rare wild species of flora and fauna • International recognition for 15 ASEAN heritage parks, 15 wetlands with RAMSAR allocation and 14 biosphere reserves[59]

NATURE-BASED SOLUTIONS IN NATIONAL AND LOCAL CONTEXT

Mainland China

China follows the "Dual Carbon" policy, expecting carbon emissions to peak by 2030 and aiming to achieve carbon neutrality by 2060.

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This involves transforming the economy, restructuring industries, integrating actions between urban and rural areas, and transforming institutions. Aligned with this policy and the "ecological civilisation" philosophy, China released the National Climate Change Adaptation Strategy 2035, emphasising proactive adaptation to climate risks. China prioritizes climate change adaptation in seven key areas, including the marine sector, with policies and blueprints for marine environmental protection, biodiversity conservation, and adaptive measures in marine and coastal ecosystems.[60]

China's new National Biodiversity Strategy and Action Plan (NBSAP) for 2023-2030 integrates biodiversity and climate actions, focusing on exploring NbS and Ecosystem-based Adaptation for climate resilience and carbon sinks.[61] The IUCN reports that China has implemented various NbS projects, including reservoir watershed management, agricultural practices, and coastal restoration.[62] Programs like the Sponge City and Climate Adaptive City Program have improved urban flood resilience.[63, 64]

In 2023, the Ministry of Natural Resource of China estabished Ecological Conservation Redlines (ECR). The redlines demarcate areas with important ecological functions, including coastal waters, wetlands, glaciers and forests that must be strictly protected. The aim is to protect these habitats and their species, while preventing flood and sandstorm, providing clean water and other ecosystem services. The ECR encompass 30% of China land area and 150,000 km^2 of sea area.
They are "no-go boundaries" for development and established as lifelines for safeguarding and maintaining national ecological security.

Ongoing projects involve conserving and restoring blue carbon ecosystems. For instance, the National Coastal Shelterbelt System aims to restore 48,650 hectares of mangrove forests by 2025.[65] Saltmarsh restoration along the Yangtze River has partly recovered mangrove forests. Various national natural reserves, such as the Yellow River Delta Nature Reserve in Shandong, was established to protect estuarine wetland ecosystems.[66]

"Nature-based Solutions approaches are already being applied in China and worldwide."

Ms Kelly Dai

Greater Bay Area

Urbanisation in the Greater Bay Area (GBA) has led to pressure for policies promoting urban ecological transformation.

© Derek Tang

The Futian mangrove wetland, a Ramsar site, exemplifies successful use of NbS. Collaboration among the Mangrove Conservation Foundation, Guangdong Neilingding Futian National Nature Reserve Administration, researchers, and stakeholders restored the wetland collectively. Actions like reconstructing the Fengtang River, redesigning fishponds for birds, and restoring mudflats and mangroves were key.

"When restored the mangroves in Shenzhen a lot of different species returned. For example, the Eurasian otter once disappeared but returned in 2020, and we also recorded more migratory birds."

Dr Patrick Yeung

Results include more migratory birds and sightings of Eurasian otters. The wetland and eco-park in Futian help climate mitigation and adaptation, acting as carbon sinks, aiding water conservation, and regulating climate. The ecosystem services' annual value is about 31.07 million yuan. WWF-Hong Kong (WWF) is collaborating with experts to enhance mangrove understanding and support regional mangrove restoration efforts through assessing carbon sequestration and wave attenuation. Public participation is vital for NbS success, so educational materials are being developed for stakeholder engagement.

"Wetland is a very important and unique habitat in the Greater Bay Area, addressing societal challenges. The soft shores on the Hong Kong side of Deep Bay are amongst the only ones remaining in the region"

Dr Carmen Or

Hong Kong

Climate Action Plan 2050: NbS was briefly mentioned in point 1.6, which refers to the Central Government's intention to draw up a timetable and roadmap towards the Dual Carbon goals, with "implementing NbS" as one of the key areas of focus.

Nature-based Solutions for the Greater Bay Area and Hong Kong

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BLUE-GREEN INFRASTRUCTURE

Although the BGI process is placed under the umbrella of NbS, not all BGI initiatives are considered as NbS.

However, BGI has the potential to facilitate the adoption of NbS in urban planning, as demonstrated with the different river revitalisation projects undertaken by the Drainage Serves Department (DSD) to prevent flooding, such as the Ho Chung River and the Upper Lam Tsuen River.[67] Some river projects in Hong Kong don't depend on a functioning ecosystem and aren't truly NbS. But they could become NbS if they follow the IUCN Global Standards.

"In 2020, the Development Bureau promoted a technical circular on blue-green infrastructures, stating that all government projects should actively consider the incorporation of the blue-green infrastructure elements."

Ir Edwin Shing Cheong Lau

COASTAL ECOSYSTEMS

Coastal wetland habitats (for e.g. salt marshes, seagrass beds, mangrove swamps, oyster reefs) play a multi-functional role in addressing climate change by acting as carbon sinks (also known as blue carbon) and mitigating climate risks like floods and storms.[68,69]

They cover less area than terrestrial or "green carbon" ecosystems but can sequester proportionally more carbon at a projected rate of 0.22Gg C km^{-2}.[70,71] Research from the Chinese Academy of Sciences shows that coastal wetlands can bury carbon 15 times faster per unit area than terrestrial ecosystems.[72,73] With 27% of Hong Kong's population and 70% of the city's economic activities situated in coastal areas, restoring coastal ecosystems such as oyster reefs, seagrass beds, and mangroves can not only help Hong Kong achieve carbon neutrality, but also enhance resilience of communities and business vulnerable to flood risks.

"Coastal blue carbon is highly stable and carbon storage can last a very long time in undisturbed areas. Therefore, we need to protect coastal ecosystems in the fight against climate change."

Prof Faming Wang

Seagrass restoration

Seagrasses provide fundamental ecosystem services. They are active carbon sinks and one of the main components of the total carbon stored in oceans (~15%)[74] helping to fight climate change.

© Kyle Obermann

With 70% of Hong Kong's economic activities situated in coastal area, restoring coastal ecosystem such as oyster reefs, seagrass beds and mangroves could enhance resilience of communities to flood risks.

Moreover, seagrasses promote sediment stabilisation and the overall seabed elevation, thus, acting as a natural buffer against coastal erosion and sea level rise.[75]

However, seagrass populations worldwide have also been affected by global transitional trends driven by human activity, such as pollution, climate change, and habitat loss.

A study found that the increased dissolution of atmospheric CO_2 largely affected the epiphyte algae, invertebrates, and microorganisms populations that seagrasses rely on for biogeochemical processes, such as carbon and nitrogen fixation and the transportation of oxygen, resulting in cascading consequences across the entire marine ecosystem and affecting the functioning of seagrasses.[76,77]

Currently, studies conducted by the University of Hong Kong (HKU) are underway to understand drivers behind the decline of local seagrasses, while developing more effective restoration efforts.[81,82]

There is a global trend of declining seagrass species[78,79], with an estimate

7%

of seagrass habitats being lost worldwide and at least 22 of the world's 72 seagrass species in decline[80], a trend that was reaffirmed by Professor Juan Diego Gaitan-Espitia's findings for seagrass populations in Hong Kong.

Preliminary results have revealed that seagrass restoration is viable and provides positive trends in biodiversity recovery, with the findings showing the return of macro-organisms as well as micro-organisms capable of reducing heavy metals in the soil.

Moreover, the study found that the revitalisation of seagrass increased the overall carbon stock capacity of the soil. Pilot studies are also currently being conducted in Western coastal areas of Hong Kong, utilising both indoor and outdoor nurseries to ensure the successful survival of seagrass sprouts.

Oyster reef restoration

Oyster reefs provide a boon of benefits, acting as natural filter feeders that improve local water quality and stabilise shorelines.

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Decades of commercial dredging for lime, coastal reclamation and over-harvesting have decimated native oyster populations with an estimated 85% loss.

Before being reclaimed for fishpond agriculture, a vast area of the wetlands in Deep Bay were intertidal, covered by natural oyster reefs and mangroves. Research from the Chinese Academy of Sciences recently found that restoring 12.5km of oyster reef and mangroves around the coastline in Deep Bay could help reduce coastal vulnerability by 7.5% in Northern Metropolis under the sea level rise scenario for 2050.

A study by TNC and HKU found that oyster reefs in Deep Bay house 6 times more diversity than adjacent soft shores. TNC and Polytechnic University are studying how oyster reef restoration on remaining mudflats can further improve coastal resilience by reducing wave impact in the Northern Metropolis and other vulnerable areas of Hong Kong.

A study by TNC and HKU found that oyster reefs in Deep Bay house **6 times more** diversity than adjacent soft shores.

"Oyster reefs, along with seagrass and mangroves, can protect coastlines from flooding and storm surges. Hong Kong has lost ~90% of its natural oyster reefs, by restoring them we not only protect our coastlines, we also improve water quality and enhance biodiversity."

Marine Thomas

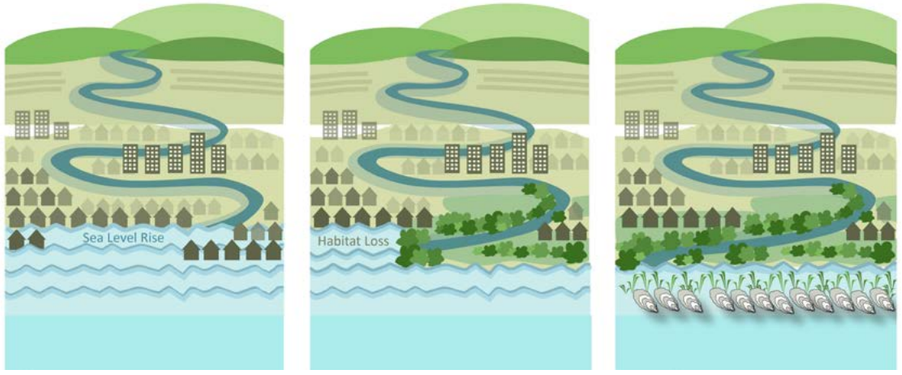
Risk Explorer allows communities to assess risk by examining their coastal exposure and social vulnerability. More importantly, it helps to identify solutions and priority sites where habitat management and restoration may most reduce risk. It is organized by state.

Coastal Hazard Risk

High Risk Areas:
Coastal development with no habitat can increase risk.

Habitat Loss and Risk:
Loss of habitat erodes the coast and increases wave energy.

Reducing Risk with Habitat Restoration:
Marshes and oysters gather sediment and reduce wave energy.



Wetland restoration

Mai Po's wetlands are facing growing threats from climate change and the abandonment of fishponds, along with illegal dumping.

To stop the wetlands from turning into drylands, WWF is working hard to maintain and manage them, by restoring mangroves in shrimp ponds that are not being actively managed, and by monitoring bird populations and studying carbon sequestration and habitat restoration's effects on productivity

"Restoring 12.5km of oyster reef and mangroves around the coastline in Deep Bay could help reduce coastal vulnerability in the Northern Metropolis by 7.5%."

– Dr Han Baolong

Terrestrial Forest Ecosystems

The benefits of forests in the fight against climate change are well known. Most of Hong Kong's primary forests no longer exists after centuries of human led deforestation.

The existing forests are in fact the result of reforestation after the Second World War, and made up of a diminished species pool that survived the centuries of exploitation, as well as non-native species that have stunted the potential for regaining lost ecosystem function.

Hong Kong has a lot of potential to restore its forest ecosystem. Today, woodland coverage still only accounts for 24% of Hong Kong's terrestrial area, while other degraded vegetated sites such as shrublands and grasslands (excluding farms) cover 35% of the landmass. A study from HKU shows that native woodlands in Hong Kong could reach a high carbon density potential of 142 tonnes C/ha.

The Northern Metropolis area also contains a substantial portion of unforested areas and badlands. As a result, the hillsides suffer from heavy erosion and regular fires, which contribute to increased flood risk and higher urban temperatures.

Badland on Castle Peak where heavy erosion is common.

"Reforestation is a crucial missing component of Hong Kong's current sponge city strategy, and should be incorporated as a cost-effective solution for flood mitigation."

Dr. Billy Hau

CASE STUDY: POTENTIAL NBS PATHWAYS IN THE NORTHERN METROPOLIS

Majority of the Northern Metropolis development is situated across floodplains of Deep Bay, an area that is particularly vulnerable to climate related risks.

Communities that live in coastal area regularly suffer great losses from flooding and severe typhoons, and these impacts are expected to worsen with climate change.

With effective management, the establishment of a network of proposed Wetland Conservation Parks, as well as reforestation of badlands presents a tremendous opportunity to not only enhance long-term conservation across the entire area, but also increase resilience of communities at the frontlines of climate related risks. To ensure it can withstand climate challenges, comprehensive urban planning and the use of NbS are crucial.

How vulnerable is the Northern Metropolis to sea level rise?

Coastal vulnerability refers to the risk associated with sea level rise and flooding from storm surges in coastal areas. A recent study by TNC and the Chinese Academy of Sciences, the "Hong Kong Northern Metropolis Coastal Vulnerability Assessment - A Technical Report", analysed the area's's vulnerability to sea level rise and storm surges using remote sensing technique, and environmental impacts model, such as InVEST® (Integrated Valuation of Ecosystem Services and Tradeoffs), and IUEMS (Intelligent Urban Ecosystem Management System). The study finds that coastal vulnerability is projected to increase by 20.73% by 2050.[83]

NbS that reduce coastal vulnerability

The study also found that actions like ecological restoration of coastal ecosystems and incorporating NbS in the Northern Metropolis' urban development planning can reduce vulnerability.

With projected sea level rise scenarios, oyster reef and mangrove restoration in coastal areas alone can decrease vulnerability by 7.5%. While the coastal resilience benefits of fishponds should also be assessed, restoring mangroves could be more cost effective than maintaining the management of engineered fishpond habitats long term.

The Comprehensive Coastal Vulnerability Index from the aforementioned study can help decide which NbS to use, considering factors like sea-level rise, population density, and ecosystem resilience.

"I believe future climate impact studies could assess mangrove restoration as an alternative to fishpond management in the Northern Metropolis, taking into account economic benefits and biodiversity impacts."

Dr Lu Zhongming

Reforestation for reduced flood risk and increased carbon sequestration

Research by HKU found that 1975 hectares of degraded shrubland or grassland in the hillside areas of the Northern Metropolis are suitable for reforestation.

This would allow an additional 340,000 tonnes of carbon sequestered by 2035, equivalent to the carbon output from 113,029 people per year.

Additionally, reforestation would increase water storage capacity of around 420,000 tonnes, significantly contributing to flood risk reduction in the event of heavy rain storms.

"The ecosystem in Hong Kong is fire-vulnerable, but not fire-adapted. Hence, hill fires have significant impacts on terrestrial biodiversity.

As degraded ecosystems, the grass and shrubs surrounding burial grounds in the Northern Metropolis face a heightened risk of fire due to incense burning practices.

Reforestation could help mitigate this risk because a closed canopy forest cannot burn. In other words, reforestation helps control the spread of fires, increases ecosystem resilience and protects communities."

Dr Billy Hau

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Summary of potential NbS pathways in the Northern Metropolis

NbS pathways suitable for Northern Metropolis	Potential area at Northern Metropolis (ha)	Climate and environmental Co-benefits
Reforestation	1975	• 340,000 tonnes of C sequestrated by 2035 • Extra 0.42M tonnes of water storage capacity • Reduce soil erosion • Enhance biodiversity • Regulate urban temperature
Seagrass restoration and protection	11	• Currently stores 526 tonnes C in total. • Extra 550 tonnes C storage from restoration across 10ha • Stabilise coastline • Support endangered species
Protecting existing mangroves	600	• 2,892 tonnes of C sequestrated by 2035 • Enhance biodiversity • Regulate urban temperature
Oyster reef restoration + mangrove restoration in coastal areas	13	• Reduce coastal vulnerability by 7.5% • Enhance biodiversity • Enhance water quality
Restore 1/3 of coastal fishponds into intertidal mangroves	200	• 14,460 tonnes of C sequestrated • Increase coastal resilience
Total NbS impact area at Northern Metropolis (hectares)	**2788 ha**	

Map of NbS potential within the Northern Metropolis

Reforestation: 1975ha

Mangrove Protection: 600ha

Mangrove Restoration: 200ha

Oyster Reef & Seagrass restoration: 13ha

"NbS could be incorporated across around 2700 hectares in the Northern Metropolis, providing significant climate and biodiversity benefits.

For example, reforestation, mangrove and seagrass restoration can sequester 14.2% of the new metropolis' carbon emissions by 2050."

Dr Felix Leung

"Reforestation can provide an extra 420,000 tonnes of water storage capacity, reducing flood risk by ~20% in certain catchment areas during a black rainstorm event.

To put this into perspective, the city-wide flooding events of September 2023 costed Hong Kong HK$1.9 billion in damages, so every little helps."

Dr Billy Hau

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Collaboration across sectors

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BUSINESS

Businesses are important for NbS. CFOs and financial heads are increasingly interested in NbS because NbS application can directly impact their profits.

There is evidence that NbS can increase property values because customers are willing to pay more for natural amenities. NbS can also reduce damage to infrastructure by mitigating flood risk. NbS can also improve overall well-being and health.

Companies can also promote environmental practices in their supply chains. This includes providing training on sustainability and the environment for all staff.
This can create a culture shift towards addressing climate change. Businesses can also influence the government to prioritise NbS. They can invest in environmental projects, as many NbS projects rely on funding from the private sector.

NON-GOVERNMENTAL ORGANISATIONS

NGOs working to engage with businesses and secure funding for NbS projects should use a multifaceted approach.

They should emphasise the financial impact of environmental issues and align them with tangible solutions that match their potential partners' values. Building strong relationships with businesses requires open communication, collaboration, and patience.

Recognising the importance of lasting partnerships underscores the need for shared goals and mutual understanding.

Public awareness is crucial for success, as any incentive's effectiveness depends on widespread support. Therefore, NGOs must engage with the wider community to foster understanding of NbS and encourage action.

NGOs also play a vital role in helping the government understand the importance of NbS.

By linking NbS with the Chinese philosophy of ecological civilisation, NGOs can encourage a cultural shift that promotes more action.

Science-based NGOs such as TNC are also actively exploring pilot sites and using new science and technologies to research the best management practice of NbS.

Policy recommendations for Hong Kong

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"Biodiversity loss and climate change are both driven by human activities and reinforce each other. They will not be successfully managed unless they are tackled together."

An approach which considers the interrelationship between biodiversity-and climate can make policy frameworks for addressing them more effective.

Accordingly, we recommend that the Hong Kong SAR government considers the following policies:

SHORT TERM ACTION

1 Raise awareness about the potential benefits of NbS and build support for NbS implementation.

The success of NbS depends on increases when the public understands and supports them.

We therefore recommend public educational programs that make people aware of nature conservation, biodiversity, and the benefits of NbS. The government can collaborate with NGOs and schools to add NbS ideas to the education syllabus.

Prevent ecosystem degradation that releases carbon into the atmosphere and/or reduces climate resilience.

It is important to prevent the conversion of ecosystems from carbon sinks into carbon sources, or turning opportunities for increased resilience into exacerbated risks. Thus, the most effective NbS for addressing climate change are often those explicitly designed to enhance and/or protect biodiversity, fostering healthy and resilient ecosystems. In particular, actions should be prioritised per the following hierarchy:

1. Avoidance **2. Minimisation** **3. Remediation** **4. Offset**

Solutions focusing on avoiding impact are more reliable and effective than restoring damaged ecosystems.

When formulating policies, prioritising avoidance may involve protecting existing biodiversity and offering clear guidance on critical biodiversity areas. Government policies can enhance biodiversity by protecting green spaces, limit land reclamation, and create biodiversity corridors which connect natural areas and thus strengthen ecosystems.

Scenario-based climate modelling that incorporates NbS should also be conducted for New Development Areas (such as the Northern Metropolis) to mitigate climate risks and promote sustainable development.

"We need to take a more holistic approach in planning for climate adaptation across the Northern Metropolis and prioritise low impact, low density activities alongside NbS implementation in coastal areas that are vulnerable to flooding.

This can enhance resilience for existing communities living on the frontline and avoid putting new populations unnecessarily in harm's way."

Marine Thomas

© Miko Lui

3 Allocate funding for nature-based solutions and encourage nature-related financial disclosure

Investments in nature can be a 'win-win' for biodiversity and development, providing a cost-effective way to reduce the city's vulnerability to climate risks.[86]

The Climate Action Plan 2050 pledged approximately HK$240 billion for climate change mitigation and adaptation over the next 15 to 20 years.

Allocating a portion of this funding to habitat protection and restoration is a huge opportunity for additional carbon sequestration, increased climate resilience and biodiversity conservation.

Embracing NbS would open new financial opportunities, such as the development of ecotourism. The sooner this funding is deployed the greater the likely cumulative benefit from it.

The government should actively encourage corporations to engage in the Task Force on Nature-related Financial Disclosures (TNFD), which has established disclosure requirements for large and transnational corporates and financial institutions to meet by 2030.

This would necessitate companies setting Science-Based Targets for Nature (SBTN), with the additional requisite that they be disclosed in financial reports. Participation in these initiatives will aid in aligning corporate operations with sustainable practices and in the long-haul, contribute towards a nature-positive future.

We further recommend the Government:

1. Publish a list of possible projects. And periodically seeks public comment as input for its decision on allocating funds.
2. Encourage businesses to:

   a. Participate in the Task Force on Nature-related Financial Disclosures (TNFD) which sets disclosure requirements for large corporations and financial institutions to meet by 2030.

   b. Where applicable set Science-Based Targets for Nature (SBTN) and disclose them in financial reports.
3. Include reforestation in Hong Kong's Sponge City strategy

These steps help align corporate practices with sustainability and contribute to a positive future for nature.

4 Adopt a co-design, co-creation, and co-management approach to NbS

To succeed with NbS, it's crucial to involve relevant stakeholders. Governments can't do it alone. They need to work together with the private sector, NGOs, local communities, and academics. Inter-departmental cooperations is also important with each department motivated to contribute its expertise and resources.

"Cooperation among different departments and a central regulatory body are essential for the success of Nature-based Solutions."

Mr. Lam Chiu Ying

Incorporating NbS and climate action into government policies, like the upcoming revision of BSAP 2023, can speed up environmental efforts with minimal cost. By integrating NGO and community efforts with corporate funding, the government can achieve sustainability goals using public resources in a cost effective manner.

Making land available for these initiatives is crucial. Even in Hong Kong's limited space, NbS, particularly the restoration of lost habitat can significantly contribute to Hong Kong's climate targets.

By working together, the government can kickstart NbS projects that benefit the environment and the community, using public resources in a cost effective manner.

One strategy is to use management agreements for ecologically important habitats, like mangrove swamps in Deep Bay and reforesting hills in the Northern Metropolis area, providing NGOs with a subvention to run restoration projects.

"If you integrate community efforts and corporate funding, the government needs to put in very few resources. The main bottleneck for NbS implementation is site access and permitting."

Dr. Billy Hau

5 Include NbS in Hong Kong's Biodiversity Strategic Action Plan and establish a government task force on nature-based solutions

China signed the KMGBF[87], so Hong Kong must update its BSAP to meet KMGBF targets, including those related to NbS.

The government should create a dedicated task force for NbS, similar to the hydrogen task force, to ensure progress. This team should be tasked with driving initiatives forward efficiently.

Establishing a central regulatory body would incentivise cooperation across departments, streamline policies, and align strategies for NbS implementation. Professionals with expertise on NbS (for e.g. restoration ecologists) should be invited to join the inter-departmental Steering Committee on Climate Change and Carbon Neutrality.

Using the Northern Metropolis Wetland Conservation Parks (WCPs) as an NbS pilot could help mitigate climate change effects and bring economic benefits through ecotourism.

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MEDIUM-TERM ACTION

1 Apply the IUCN Global Standard for Nature-based Solutions™

Hong Kong should follow international standards for NbS, like the IUCN Global Standard, to effectively implement NbS.

This standard ensures NbS address climate change, biodiversity loss, and societal challenges worldwide. It prevents NbS misuse and helps them go from local to global use.
Adhering to this standard ensures NbS are effective and address societal challenges.

For example, to ensure the Standard's criterion 3 biodiversity net gain is achieved, the government can adopt a nature-positive Key Performance Indicator (KPI).

2 Mainstream NbS into decision-making

Development projects must integrate NbS in planning and decision-making. The government should require all projects to include conservation principles, balancing urban expansion and economic growth with protecting natural habitats and biodiversity.

The Hong Kong Planning Standard Guideline (HKPSG) needs updating to maintain, enhance, or restore ecosystem integrity, connectivity, and resilience, preventing further loss of areas with high biodiversity.

It should include sponge cities, urban-NbS, and ecological connectivity concepts. NbS strategies should be fully developed under Hong Kong's Climate Action Plan.

"Restoration is about fixing ecosystems that we have destroyed. Done well, it provides a tremendous opportunity to contribute to HK's climate and biodiversity goals.

What's more, existing or earmarked conservation areas cannot be developed, so in this instance there is no trade-off to restoration, only benefits to be gained."

Marine Thomas

LONG-TERM ACTION

3

Create a comprehensive and adaptive monitoring and evaluation plan

Scientific evidence is crucial for NbS policies. It helps set targets and ensures goals align. Without it, tracking progress becomes difficult, hindering development and funding. Policies need criteria to assess effectiveness. A monitoring and evaluation plan is essential for learning and adaptation. Governments must identify new risks and involve stakeholders.

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4

Include NbS in the management of protected areas and restore Hong Kong's degraded ecosystems

To help achieve the Convention on Biological Diversity's goals, including restoring 30% of degraded ecosystems, the government should work closely with NGOs, academics, and local communities. They should study and find areas suitable for wetland or forest restoration, focusing on using native species to improve local ecosystems' resilience to climate change.

In Hong Kong, the government can restore ecosystems by converting covered culverts into open waterways for riverine ecosystems, reforesting fire-damaged hillsides, expanding forested areas in country parks, encouraging the rehabilitation of abandoned farmland, and restoring key ecosystems like intertidal mudflats, oyster reefs, seagrass beds, mangrove forests, and coral communities. The government can support these efforts by using management agreements, providing NGOs with an initial funding for NbS, facilitating permits for NbS projects, and establishing special funds for ecological restoration. They should also develop restoration guidelines and standard practices similar to those used on the mainland.

Additionally, the government should update the Environmental Impact Assessment (EIA) process to incorporate restoration standards. This would make the process more efficient, ensure consistency in mitigation strategies, and avoid approaches that lack ecological value or clear guidelines.

1

Develop a long-term vision in harmony with nature

The United Nations Convention on Biological Diversity aims for harmony with nature by 2050. Developing
a 50-year strategy is crucial for NbS.

One challenge is the mismatch between the time needed for NbS projects like reforestation to show results and the typical tenure of government officials. To solve this, governments should create long-term vision which aligns with global goals, that outlast officials' terms, ensuring continuity and commitment to NbS projects.

This approach would encourage civil servants to take on these initiatives and create a lasting impact on the environment, supporting global efforts for sustainable solutions to climate change.

The Nature Positive initiative and possible International Sustainability Standards Board Biodiversity Standard may be important to managing biodiversity but are not included in this report as they are still being formulated.

"Government officials often ask how long would it take for the forest to form? Obviously, this is an important consideration in policy development but NbS and restoration takes time, you cannot achieve it overnight. The same way that climate planning is not a short term excercise."

Dr. Billy Hau

"Persistence is key; NbS pilot projects may not succeed in the first try, but one success can sustain you for a decade or more."

Mr. Lam Chiu Ying

© Jeanny Tang | TNC Photo Contest 2023 winner

2 Carry out landscape-level intervention

Existing Nature-based Solutions (NbS) around the world are of different sizes. However, the International Union for Conservation of Nature (IUCN) notes that current NbS projects are not big enough.[88]

This limits their ability to manage relationships, dependencies, and benefits both upstream and downstream.

A landscape-level approach, which considers physical features and the people living there when developing NbS, allows for the consideration of larger ecological processes and interactions. It also gives crucial spatial information for designing NbS effectively. Therefore, NbS projects should be scaled up to the landscape level whenever possible to get the most benefits from the intervention.

For example, using a landscape-scale NbS approach in the Northern Metropolis could be very effective. Efforts could focus on restoring wetlands in low lying areas and forests on hills, helping prevent floods and supporting river revitalisation efforts downstream.

3 Pursue the Ramsar Wetland City accreditation for the Northern Metropolis

The Ramsar Wetland City accreditation is a big chance for Hong Kong to show its commitment to wetland conservation globally.

Many Chinese cities are interested, with 43 already accredited. Hong Kong could also aim for this recognition.

Additionally, Shenzhen's potential to become the world's best city with a wetland highlights the competition and underlines Hong Kong's need to explore and seek Ramsar Wetland City designation, possibly with Mainland China's support.

This recognition not only acknowledges environmental efforts but also boosts Hong Kong's global status in wetland conservation.

A warning from the World Meteorological Organisation and the Way Forward

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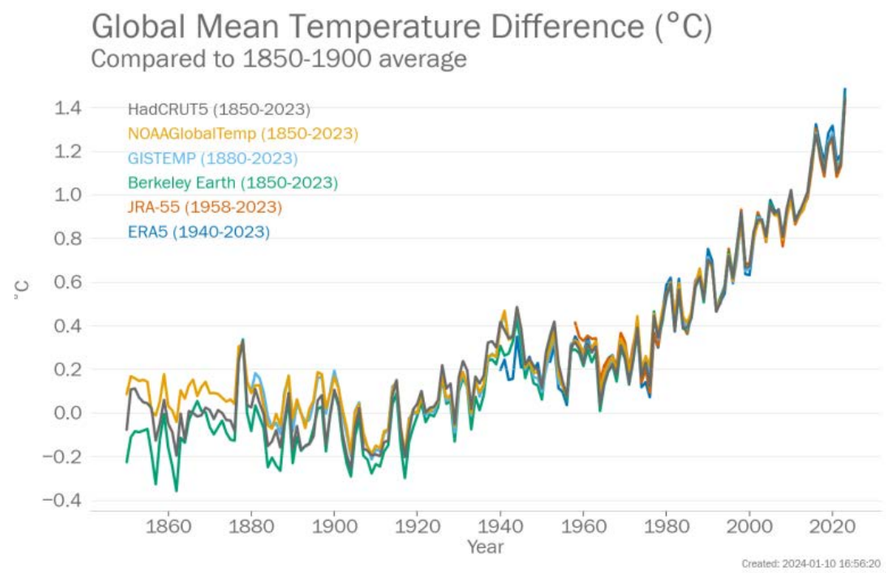

The World Meteorological Organization issued this graph in January 2024 advising that the average temperature for 2023 1.45 ± 0.12 °C above pre-industrial levels and that 2024 is expected to be possibly even warmer.

To quote WMO Secretary-General Prof. Celeste Saulo:

"Climate change is the biggest challenge that humanity faces. It is affecting all of us, especially the most vulnerable.

We cannot afford to wait any longer. We are already taking action but we have to do more and we have to do it quickly. We have to make drastic reductions in greenhouse gas emissions and accelerate the transition to renewable energy sources (...)"[89]

NbS can help Hong Kong adapt and mitigate climate change. Action is urgent and most effective if we take a 'whole-of-society' approach is key to mainstreaming NbS overall.

Everyone has a role: the government can integrate NbS into policies, businesses can support NbS initiatives, and green groups and academics can educate and encourage a green lifestyle.

Civic Exchange and TNC will work with other stakeholders to establish an NbS consortium to advocate collective climate and biodiversity action further and host a second NbS forum in late 2024.

"There's a long way to go to mainstream NbS for Climate. It's still vague in the HK2030 Climate Action Plan, and barely mentioned in the Chief Executive's Policy Address.

Climate mitigation through energy and transport efficiency is undoubtably substantial component to HK's climate resilient future, however, as long as we keep developing our economy, there will be emissions and footprints.

Nature is our indispensable rescue and cure. With that conviction, I trust our like-minded community will work together to raise visibility of NbS and make actionable proposals on NbS for Climate."

Lulu Zhou

"I'm calling everyone to work together, mainstream nature-based solutions, and try to surround our stakeholders more frequently and help them understand the potential of the nature-based solutions."

Mr. Lawrence Iu

A photo captured at Pak Nai, Nim Wan Road on September 6, 2023, during the severe flooding caused by a black rainstorm. The Ap Tsai Hang river overflowed, submerging the surrounding area. The September flood event in Hong Kong led to massive damages, triggering a record-breaking US $244 million in insurance claims—a historic economic loss for Hong Kong from natural disaster.

Pak Nai on a regular day.

GLOSSARY

Biodiversity

Biodiversity—short for biological diversity—means the diversity of life in all its forms. The variability among living organisms from all sources, including, inter alia, terrestrial, marine, and other aquatic ecosystems as well as the ecological complexes of which they are part; this includes diversity within species, between species, and of ecosystems.[90]
An estimated 40 per cent of the global economy is based on biological products and processes.[91]

Blue-green infrastructure (BGI)

Blue-green infrastructure is an urban flood resilience approach that leverages the advantages of utilising urban green spaces and natural water flows. Examples of BGI include green roofs, retention and detention ponds, re-naturalised and de-culverted rivers, swales and 'bioswales,' or rain gardens. BGI is considered a more environmentally friendly method of managing urban flood risks, particularly pluvial flooding.[92]

Carbon neutrality

This term describes the concept of achieving net-zero greenhouse gas emissions. It involves balancing the emissions produced by human activities with the amount of greenhouse gases removed naturally by the Earth's processes, such as absorption by forests and oceans.[93]

Carbon sinks

A reservoir that absorbs carbon dioxide from another part of the carbon cycle and stores it. Natural carbon sinks include forests, soils, peat, permafrost, and the ocean; manmade reservoirs include buildings and factories outfitted with carbon-capture technologies.[94]

Climate adaptation

Climate adaptation refers to the adjustment in natural or human systems to respond to actual or expected climatic stimuli or their risks, thus moderating harm and seizing beneficial opportunities.[95]

Climate mitigation

This refers to the efforts aimed at decreasing the release of carbon emissions into the atmosphere and reducing current atmospheric concentrations of carbon dioxide (CO2) by enhancing sinks, such as increasing the area of forests.
Convention on Biological Diversity: The United Nation Convention on Biological Diversity came into effect on December 29, 1993, with three primary goals: conserving biological diversity, promoting the sustainable use of its components, and ensuring the fair and equitable sharing of benefits derived from genetic resources.[96]

Ecological restoration

It is the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed.[97]

Ecosystem

The dynamic complex of plant, animal, and microorganism communities and their non-living environment interacting as a functional unit.[98] Ecosystems are vulnerable to external factors, such as pollution, can place pressure on one component, which can disrupt the system's entire stability. Many ecosystems have already been lost, and many others are at risk.

Ecosystem-based Adaptation

The use of ecosystem management activities to increase the resilience and reduce the vulnerability of people and ecosystems to climate change.[99]

Ecosystem services

The benefits people obtain from ecosystems, including provisioning services, such as the supply of food, fibre, timber, and water; regulating services, such as carbon sequestration, climate regulation, water regulation and filtration, and pest control; cultural services, such as recreational experiences, educational, and spiritual enrichment; and supporting services, such as seed dispersal and soil formation.[100]

Ecosystem connectivity

It is the unimpeded movement of species and the flow of natural processes that sustain life on Earth. It involves the ability of animals (both on land and in water) to move freely from place to place, allowing them to find food, breed, and establish new territories.[101]

Ecosystem integrity

It is the degree to which an ecosystem's components, such as species, habitats, and ecological processes, resemble their natural or undisturbed state.
It reflects the ecosystem's overall health, resilience, and ability to function as intended.[102]

Intergovernmental Panel on Climate Change (IPCC)

The IPCC is the United Nations body for assessing the science related to climate change. It was created to provide policymakers with regular scientific assessments on climate change, its implications and potential future risks, as well as to put forward adaptation and mitigation options.[103]

The International Sustainability Standards Board (ISSB)

It has consulted on whether to issue a standard for corporate reporting on Biodiversity. It is expected to decide what to do on this shortly.[104,105]

Kunming-Montreal Global Biodiversity Framework

It is a historic agreement adopted during the fifteenth meeting of the Conference of the Parties (COP 15) to the Convention on Biological Diversity. This framework sets out an ambitious pathway to achieve a global vision of a world living in harmony with nature by 2050 and halt and reverse biodiversity loss by 2030. It includes four goals for 2050 and 23 targets for 2030.[106]

National Biodiversity Strategy and Action Plan (NBSAP)

The Convention on Biological Diversity calls on each of its Parties to prepare a National Biodiversity Strategy and Action Plan (Article 6a) that establishes specific activities and targets for achieving the objectives of the Convention. These plans mostly are implemented by a partnership of conservation organisations. NBSAPs do not carry legal status and listed species and habitat types are not necessarily protected (although some are covered by other legislation).[107]

The Nature Positive Initiative

It proposed the following Global Goal for Nature'(www.naturepositive.org) : 'Halt and reverse nature loss measured from a baseline of 2020, through increasing the health, abundance, diversity and resilience of species, populations and ecosystems so that by 2030 nature is visibly and measurably on the path of recovery.

Paris Agreement

The Paris Agreement is a legally binding international treaty on climate change. It was adopted by 196 Parties at the UN Climate Change Conference (COP21) in Paris, France, on 12 December 2015. The agreement entered into effect on 4 November 2016. Its overarching goal is to hold "the increase in the global average temperature to well below 2°C above pre-industrial levels" and pursue efforts "to limit the temperature increase to 1.5°C above pre-industrial levels. Countries communicate actions they will take to reduce their greenhouse gas emissions and build resilience to adapt to climate change through submission of a document called Nationally Determined Contributions (NDC).[108]

Resilience

This refers to the capacity of a system to recover from disturbances and the scope of disturbance that an ecosystem or society can undergo without drastically changing the internal structures or outputs. Resilience depends on factors such as ecological dynamics and the organisational and

institutional capacity to understand, manage and respond to these dynamics.[109]

Restoration

The return of an ecosystem or habitat to its original community structure, natural complement of species, and natural functions.[110]

Ramsar Wetland City accreditation

This is a voluntary scheme established by the Convention on Wetlands (also known as the Ramsar Convention). This scheme recognises cities that value and actively conserve their wetlands. The Ramsar Wetland City accreditation provides an opportunity for cities that are able to meet the criteria to showcase their commitment towards wetland conservation and sustainable urban development.[111]

Science-Based Targets for Nature

These measurable, actionable, and time-bound targets give companies and cities clear, science-backed pathways to ensure competitiveness and enhance resilience, further defining their roles in restoring nature. It represents an important step in aligning business sustainability strategies with global environmental goals. These targets are rooted in scientific evidence and aim to address both climate change and nature loss.[112]

Sponge cities

This is an approach to manage stormwater and decrease urban flooding through increased infiltration, detention, storage, treatment and drainage. This usually incorporates different techniques, such as natural features and other well-designed infrastructural components, such as permeable pavements and bio-retention cells.[113]

Sustainable development

Development that meets the needs and aspirations of the current generation without compromising the ability to meet those of future generations.[114]

Task Force on Nature-related Financial Disclosures

It is a global initiative that encourages and enables businesses and financial institutions to assess, report, and act on their nature-related dependencies, impacts, risks, and opportunities. It aims to integrate nature into decision-making processes, supporting a shift in global financial flows toward nature-positive outcomes that aligns with the Global Biodiversity Framework.[115]

United Nations Framework Convention of Climate Change (UNFCCC)

Established in 1992, the UNFCCC is the foundational treaty that forms the basis for other international climate negotiations, such as the Paris Agreement and the Kyoto Protocol. Its ultimate objective is to achieve the "stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system" within a sufficient time frame to allow for the adaptation and the sustainable development of ecosystems and society.[116,117]

Whole-of-government approach

A whole-of-government approach refers to a process wherein the government actively utilises formal and/or informal networks across different agencies within its structure to coordinate the design and implementation of a range of interventions, with the aim to increase overall effectiveness towards achieving objectives and targets. The concept emphasises collaboration and coordination among various parts of the government.[118]

Whole-of-society approach

This approach involves civil society, public, and private sectors to pursue common solutions to complex problems and facilitate establishing effective partnerships and opportunities for cooperation. This approach embraces both formal and informal institutions in seeking a generalised agreement across society about policy goals and the means to achieve them.[119]

ORGANISATIONS SPONSORING THIS REPORT

思匯 CIVIC EXCHANGE

Civic Exchange is an independent Hong Kong public-policy think tank established in 2000.

We use in-depth research and dialogue to inform policy and engage stakeholders on addressing environmental and development challenges in Hong Kong. Our research covers four areas that make up a liveable city: environmental, economic, social, and governance.

Civic Exchange has been ranked among the top 50 environmental think tanks in the world by the Lauder Institute at the University of Pennsylvania since 2011.

The Nature Conservancy 大自然保護協會

The Nature Conservancy (TNC) is a global conservation organisation dedicated to conserving the lands and waters on which all life depends.

Guided by science, we create innovative, on-the-ground solutions to our world's toughest challenges so that nature and people can thrive together. We are tackling climate change, conserving lands, waters and oceans at unprecedented scale, providing food and water sustainably and helping make cities more sustainable.

Working in 76 countries and territories, we use a collaborative approach that engages local communities, governments, the private sector, and other partners. TNC has more than 400 scientists working on environmental and ecological challenges, and we aim to harness our global expertise and established experience on the ground in Hong Kong.

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SPEAKERS OF THE NATURE-BASED SOLUTIONS FOR CLIMATE FORUM

On October 27, 2023, The Nature Conservancy (TNC) and Civic Exchange jointly organised The Nature-Based Solutions for Climate Forum.

The event saw the participation of over 90 individuals in person, including representatives from the government, related industries, and interested corporations. The forum provided a crucial platform for stakeholders to delve into the transformative potential of nature-based solutions (NbS) and their role in climate mitigation and adaptation.

This report aims to recap the discussions held during the forum and chart a course for Hong Kong in developing NbS as a fundamental aspect of climate action, highlighting the imperative role of nature in addressing the challenges posed by climate change.

The order of speakers is listed alphabetically.

Dr Vincent Cheng
ARUP

Dr Ting Fong May Chui
University of Hong Kong

Ms Kelly Dai
ICLEI – Local Governments for Sustainability

Prof Juan Diego Gaitan-Espitia
Swire Institute of Marine Science,
University of Hong Kong

Mr Robert Gibson
Civic Exchange

Dr Baolong Han
Research Centre for Eco-Environmental Science,
Chinese Academy of Sciences

Dr Billy Hau
School of Biological Science,
University of Hong Kong

Mr Lawrence Iu
Civic Exchange

Mr Lam Chiu-ying
Hong Kong Countryside Foundation,
HK2050isNow

Mr Lau Shing Cheong, Edwin
Drainage Service Department

Mr Tobi Lau
WWF-Hong Kong

Dr Felix Leung
The Nature Conservancy

Dr Carmen Or
WWF-Hong Kong

Ms Kitty Tam Tsz-ching
Civic Exchange, HK2050isNow

Ms Marine Thomas
The Nature Conservancy

Prof Faming Wang
South China Botanical Garden,
The Chinese Academy of Sciences

Dr Patrick Yeung
Mangrove Conservation Foundation, Shenzhen

Ms Lulu Zhou
The Nature Conservancy

The Nature Conservancy
大自然保護協會

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