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HONG KONG

ADOPTING NATURE-BASED SOLUTIONS FOR A BETTER HONG KONG

February 2024

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FOREWORD

The world is currently in a state of emergency – humanity is facing multifaceted societal and environmental challenges stemming from climate and biodiversity crises. In Hong Kong, we have been experiencing rising temperatures alongside more frequent and intense extreme weather events, and recently witnessed a record-breaking rainstorm that wreaked havoc to our city. Prolonged heat waves, that exacerbate air pollution and pose health risks, have also become the norm.

Nature-based Solutions (**NbS**) offer a promising approach to address many of the environmental and societal challenges facing Hong Kong. Our limited land and highly modified ecosystems mean we must make the most of working with nature. This publication explores how NbS can help mitigate climate change, improve public health and well-being, and enhance biodiversity — all while creating more livable, sustainable communities.

Through local case studies and potential projects, we illustrate how restoration of coral and forest, sustainably managed natural assets like wetlands, and better stewardship of remaining natural areas could provide multiple benefits to both humans and nature. As interest in understanding and adopting NbS continues to grow among stakeholders across Hong Kong, this publication aims to illustrate its principles, showcase its implementation, and strengthen the place of nature in urban planning so we can better respond to pressing issues through nature-positive solutions.

Dr. Bosco Chan
Director, Conservation
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In the past, the conservation of nature has often been seen as secondary or even an obstacle to economic development. However, growing scientific evidence shows that nature is in fact crucial for human existence, good quality of life and economic growth. Neglecting nature health not only leads to an unsustainable model of economic growth, but also overlooks the potential of harnessing nature in helping resolve major societal challenges such as climate change, human health and well-being, and disaster risk reduction.

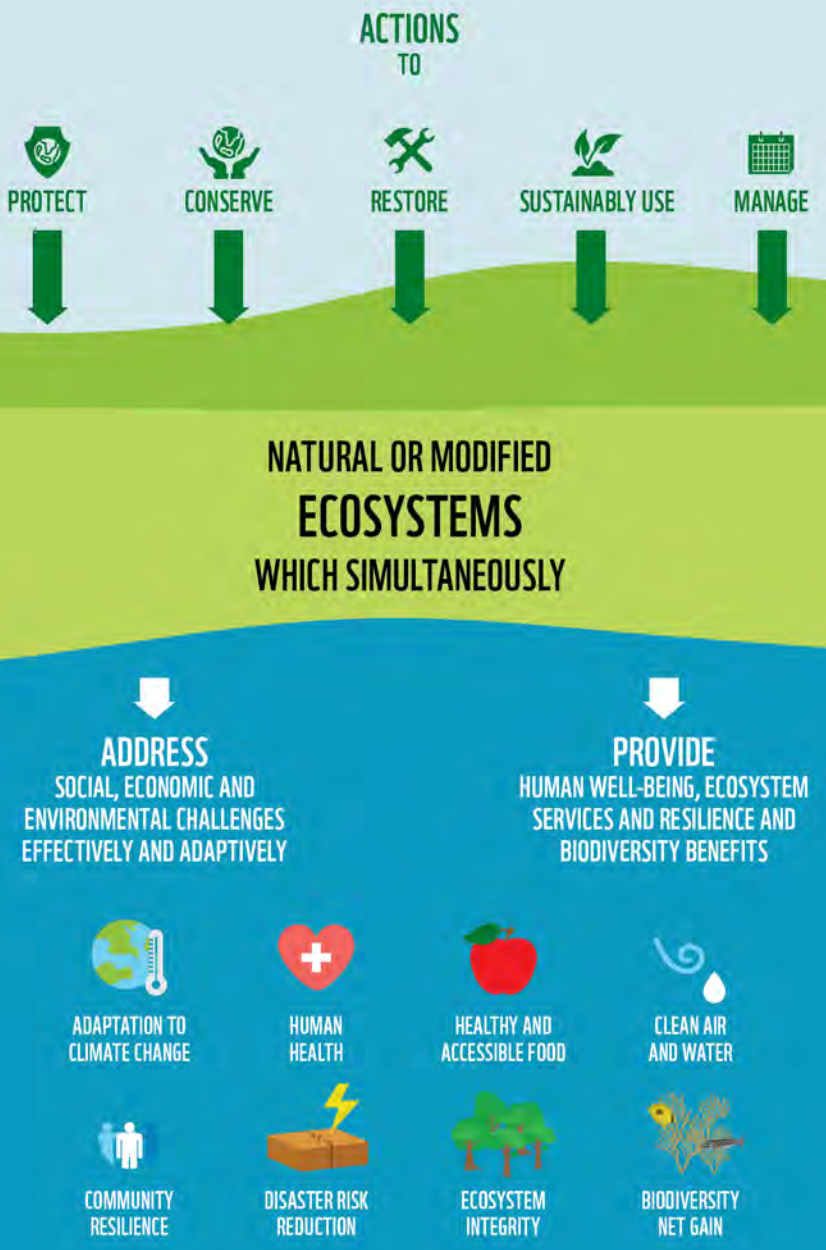
Nature-based Solutions (**NbS**) provide an alternative to conventional solutions to environmental, social, and economic problems by utilising natural systems and processes to create equitable, resilient, and sustainable solutions.

DEFINITION

In 2022, the UNEA formally adopted a multilaterally agreed definition of NbS[1], recognising the important role of NbS in the global response to climate change and its social, economic, and environmental effects:

NbS are actions to protect, conserve, restore, sustainably use, and manage natural or modified terrestrial, freshwater, coastal and marine ecosystems, which address social, economic, and environmental challenges effectively and adaptively, while simultaneously providing human well-being, ecosystem services and resilience and biodiversity benefits.

As such, NbS comprise a broad set of responses that protect, restore, or proactively manage landscapes, seascapes, watersheds, and city corridors in such a way that the societal services they provide can be maximised[2] .



IUCN GLOBAL STANDARD FOR NBS

Increased demand for NbS has led to some cases of misuse of the concept, which have resulted in harm to nature and people despite good intentions, for instance:

- In tree plantation, utilising a single non-native species risks depleting biodiversity over time and jeopardising the long-term viability of a diverse forest ecosystem.
- Failing to account for water use can pose serious strain on water resources particularly in water stressed environments, which could in turn place undue strain on local communities.

Poorly designed or initiatives inaccurately described as NbS can significantly weaken the case for this approach, thereby discouraging its application, eroding donor confidence, and misdirecting efforts. In response to this, the IUCN has created its "Global Standard for Nature-based Solutions"[3], a framework for the verification, design, and scaling up of NbS.

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The IUCN Global Standard for NbS includes a self-assessment tool that consists of eight criteria and associated indicators which address the pillars of sustainable development and resilient project management:

CRITERION 1
NBS EFFECTIVELY ADDRESS SOCIETAL CHALLENGES

CRITERION 2
DESIGN OF NBS IS INFORMED BY SCALE

CRITERION 3
NBS RESULT IN A NET GAIN TO BIODIVERSITY AND ECOSYSTEM INTEGRITY

CRITERION 4
NBS ARE ECONOMICALLY VIABLE

CRITERION 5
NBS ARE BASED ON INCLUSIVE, TRANSPARENT AND EMPOWERING GOVERNANCE PROCESSES

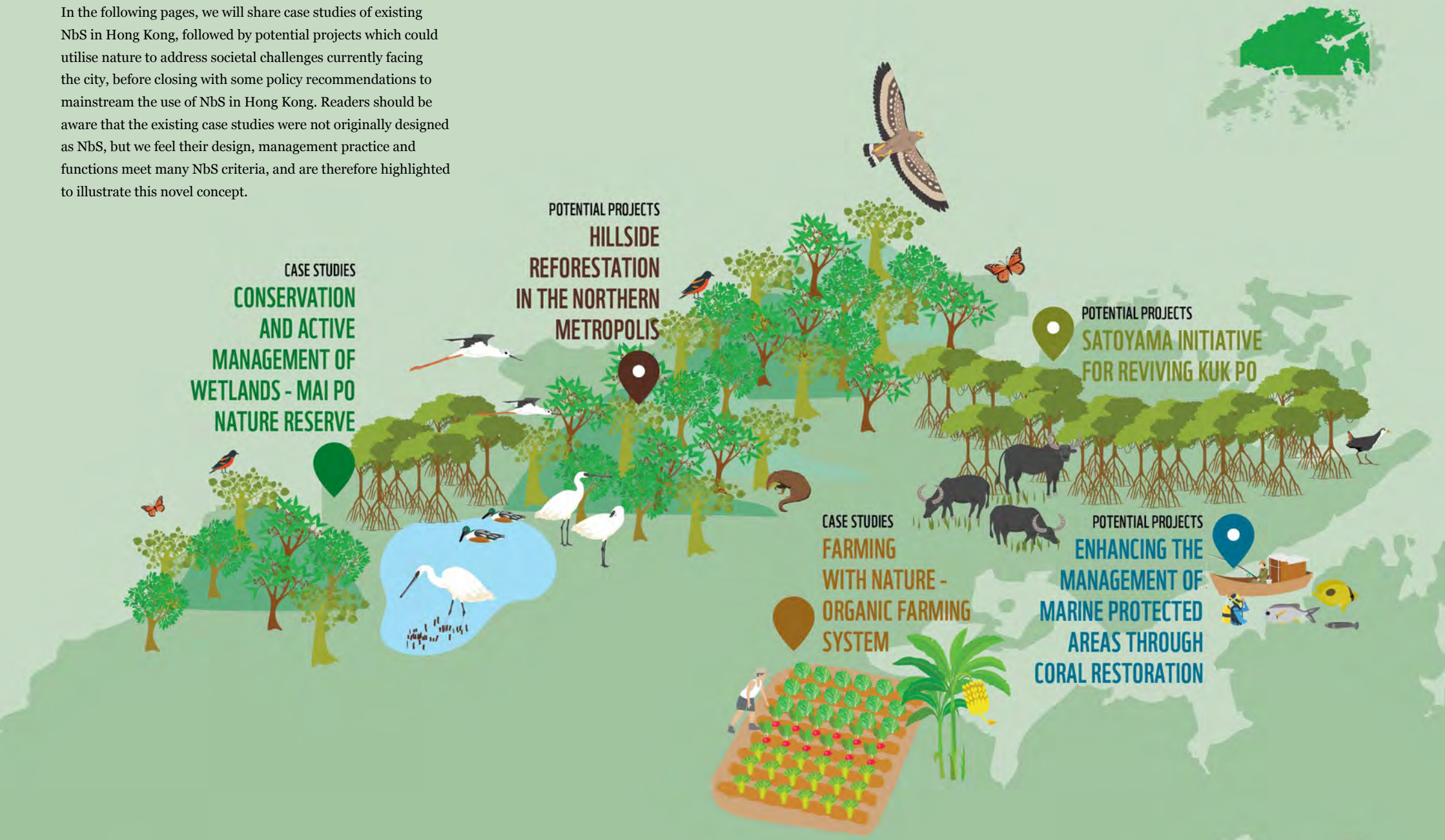
CRITERION 6
NBS EQUITABLY BALANCE TRADE-OFFS BETWEEN ACHIEVEMENT OF THEIR PRIMARY GOAL(S) AND THE CONTINUED PROVISION OF MULTIPLE BENEFITS

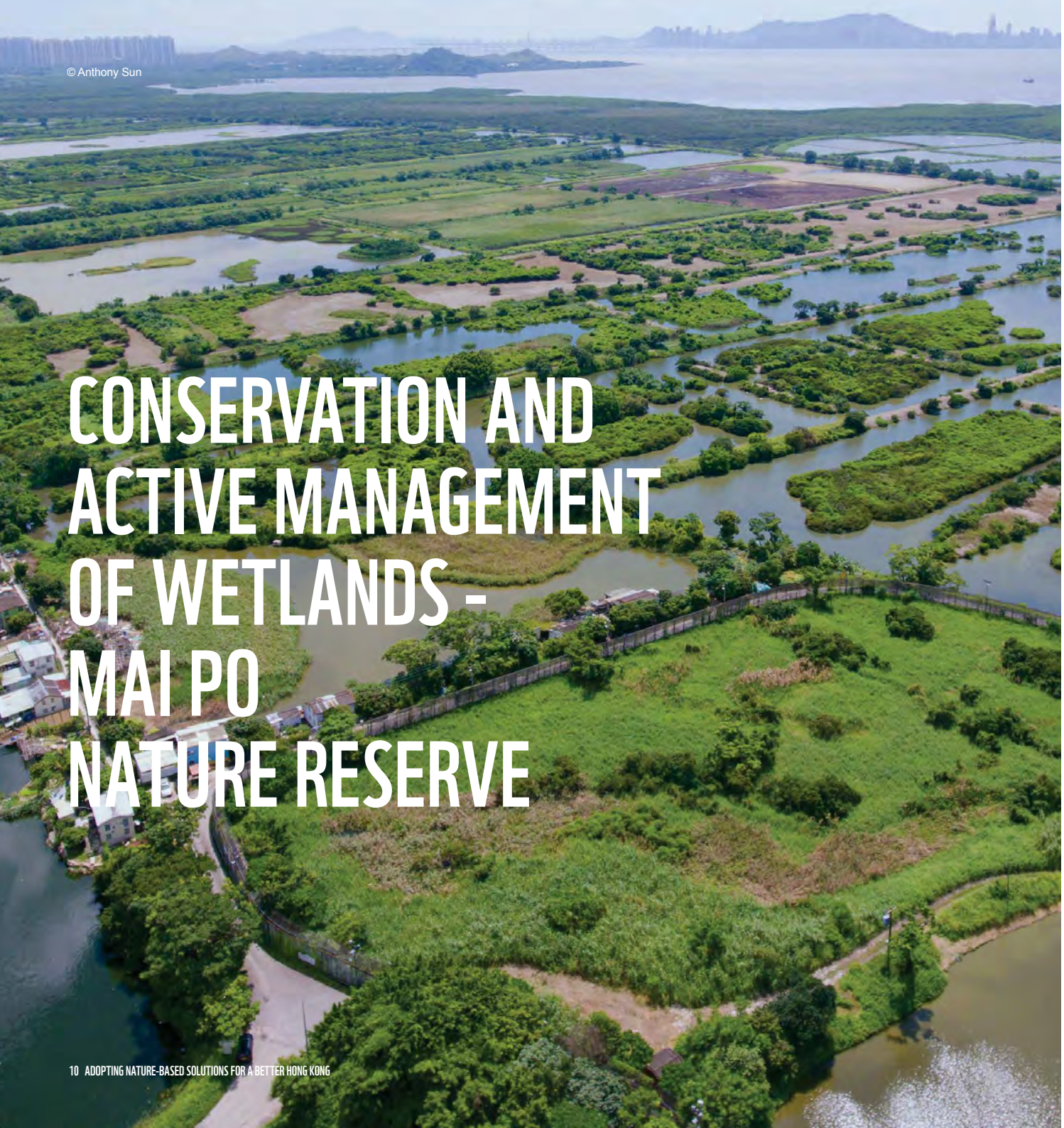
CRITERION 7
NBS ARE MANAGED ADAPTIVELY, BASED ON EVIDENCE

CRITERION 8
NBS ARE SUSTAINABLE AND MAINSTREAMED WITHIN AN APPROPRIATE JURISDICTIONAL CONTEXT

The document is intended for use by governments, businesses, NGOs, etc to design new NbS, upscale pilots and, by using the self-assessment tool, verify implemented or proposed NbS in line with the prescribed criteria (above). Completing the self-assessment produces an output of a percentage match compared against good practices, with a traffic light system identifying areas requiring further work.

In the following pages, we will share case studies of existing NbS in Hong Kong, followed by potential projects which could utilise nature to address societal challenges currently facing the city, before closing with some policy recommendations to mainstream the use of NbS in Hong Kong. Readers should be aware that the existing case studies were not originally designed as NbS, but we feel their design, management practice and functions meet many NbS criteria, and are therefore highlighted to illustrate this novel concept.





CONSERVATION AND ACTIVE MANAGEMENT OF WETLANDS - MAI PO NATURE RESERVE

CASE STUDY

Rapid urbanization in the 1970s has led to substantial wetland loss in the Deep Bay area of northwestern New Territories. To better protect this globally important coastal wetland, the 380 ha Mai Po Nature Reserve (**MPNR**) was set up in 1983, and subsequently listed as the Mai Po and Inner Deep Bay Ramsar Site on 4 September 1995 together with about 1,200 ha of surrounding wetlands.

MPNR comprises of mangroves and brackish *gei wai* (traditionally managed shrimp ponds) that provide critical habitats for migratory birds – the Deep Bay area annually supports over 70,000 migratory waterbirds along the EAAF – and provides a range of environmental and socioeconomic benefits for the citizens of Hong Kong and neighbouring Shenzhen. It has been managed by WWF-Hong Kong under the auspices of the Agriculture, Fisheries and Conservation Department since 1983, with the primary goals of maintaining and enhancing wetland habitats and protecting biodiversity and key species in the area. It is also well-known locally for providing environmental education to students and the public: indoor exhibits promote wetland conservation; bird hides and boardwalks facilitate outdoor wetland experience and birdwatching.

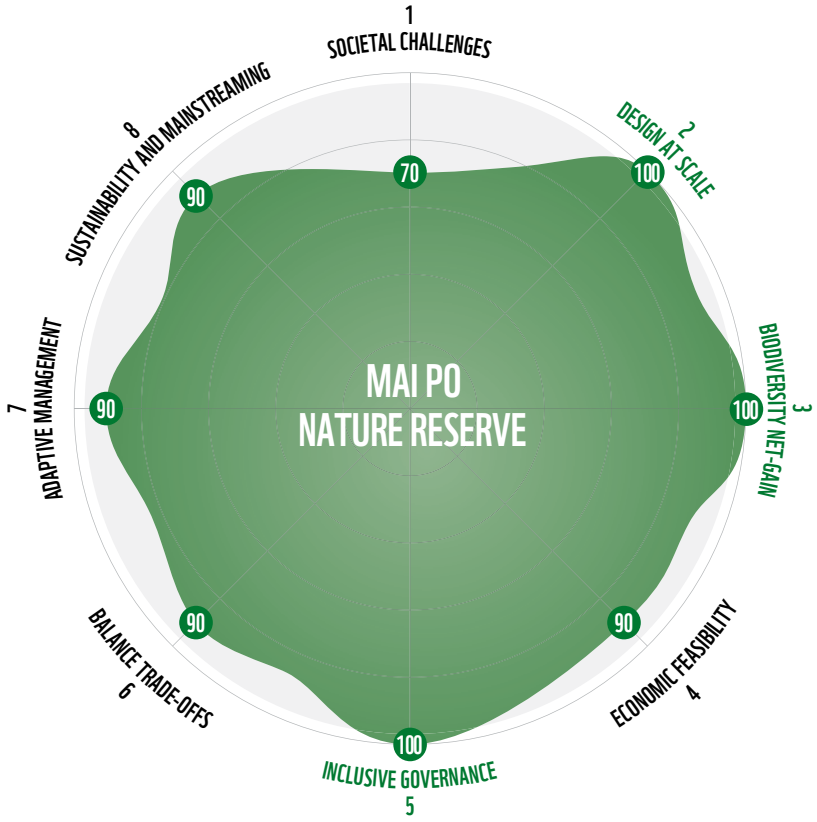
While MPNR primarily serves as a sanctuary for biodiversity, studies show that connecting with and spending time in nature is vital for human health and well-being. In a densely populated city like Hong Kong, MPNR offers citizens a rare chance to immerse themselves in open wilderness. The numerous ponds and wetlands in MPNR also alleviate risk of natural disasters to neighbouring coastal settlements, transportation networks, and infrastructure posed by more frequent occurrences of extreme weather events under climate change by increasing the resilience of this area against floods and storm surges.

MPNR AS AN NBS

Despite the fact that MPNR was established long before the term "NbS" was coined, its primary objective as a well-protected wetland for biodiversity conservation embedded key components of an NbS, demonstrating how protection and sustainable management of wetlands benefit human health and well-being. Management concepts that enable MPNR to perform as an NbS include:

- The Mai Po Management Plan and the Mai Po Inner Deep Bay Ramsar Site Management Plan set clear targets on biodiversity conservation, education, and training.
- Water buffalo are maintained to perform the role of "ecosystem engineers" by restoring rain-fed open marsh for dependent wildlife.
- Intertidal mangroves are well protected to maintain natural processes and provide ecosystem services.
- Long-term monitoring programmes and collaborative research projects cover different objectives to inform adaptive management.
- Local researchers, conservationists, wetland managers, educators, representatives of local NGOs and the government are regularly consulted to advise WWF-Hong Kong on site management, research, species conservation and education.
- Management work is financially supported by government subvention, corporate donations, and philanthropy.
- The natural environment and facilities at MPNR are used as a key platform to raise awareness for wetland conservation. Visitor facilities such as the Peter Scott Visitor Centre, Education Centre, bird hides, and boardwalks are built with universal access and maintained for nature-based tourism, experiential learning, educational and training purposes.
- To share experience gained in managing MPNR with other wetlands along migratory bird flyways, training courses are regularly organised. A flyway site network is maintained with other wetlands to mainstream wetland conservation.
- Active communication is maintained with local communities to understand and provide assistance to livelihood challenges. Guided eco-tours and events for these communities are also regularly organised.

IUCN GLOBAL STANDARD FOR NBS: SELF-ASSESSMENT

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- Based on the assessment, MPNR adheres strongly to the IUCN Global Standard for NbS, with a total percentage match of 91%. Full scores are achieved in Criteria 2, 3, and 5, while other criteria demonstrate strong performance. Criterion 1 receives an adequate rating.
- The setting up of Mai Po Management Committee and other committees has laid the foundation for meeting Criteria 3, 5 and 6. High ratings for Criteria 3 and 7 are achieved through a robust regular monitoring programme guided by the Mai Po Management Plan. Decision-making is informed by science-based data, and close relationship with the surrounding local community is maintained through regular engagement events.
- As for societal challenges effectively addressed by MPNR (Criterion 1), ongoing projects include filling knowledge gaps on the contribution of MPNR to public safety (e.g. how mangroves contribute to disaster risk reduction and climate change mitigation) and benchmarking visitors' improved physical and mental health as a result of reconnecting with nature. Depending on the results of these projects, Criterion 1 could be better met by incorporating targets to address societal challenges in future management plans.

BIODIVERSITY NET GAIN

MPNR plays a crucial role as a staging and wintering site for migratory birds in EAAF, which is the most species-rich yet the most threatened flyway in the world[4]. It is also a refuge for precious biodiversity such as the highly threatened Eurasian Otter (*Lutra lutra*) and the endemic Mai Po Box Jellyfish (*Tripedalia maipoensis*).

CO-BENEFITS FOR ENVIRONMENT AND HUMAN WELL-BEING

Climate change mitigation: mangroves are an effective carbon sink.

Disaster risk reduction: mangrove forests reduce the effect of storm surges and mitigate the impact of extreme weather for coastal communities. *Gei wai*, ponds, and marshes act as flood retention ponds to store storm water magnified by climate change.

Green employment and opportunities for green investment: green jobs, such as reserve personnel and eco-tour guides, are created and sustained. Management works are financially supported by government subvention, corporate donations, and philanthropy. There is potential for corporate investment in ESG initiatives such as carbon and/or biodiversity credits.

Stabilised fishery supply: mangroves are critical nursery grounds for fishery species and MPNR supports one of the largest mangrove forests in the Pearl River Estuary.

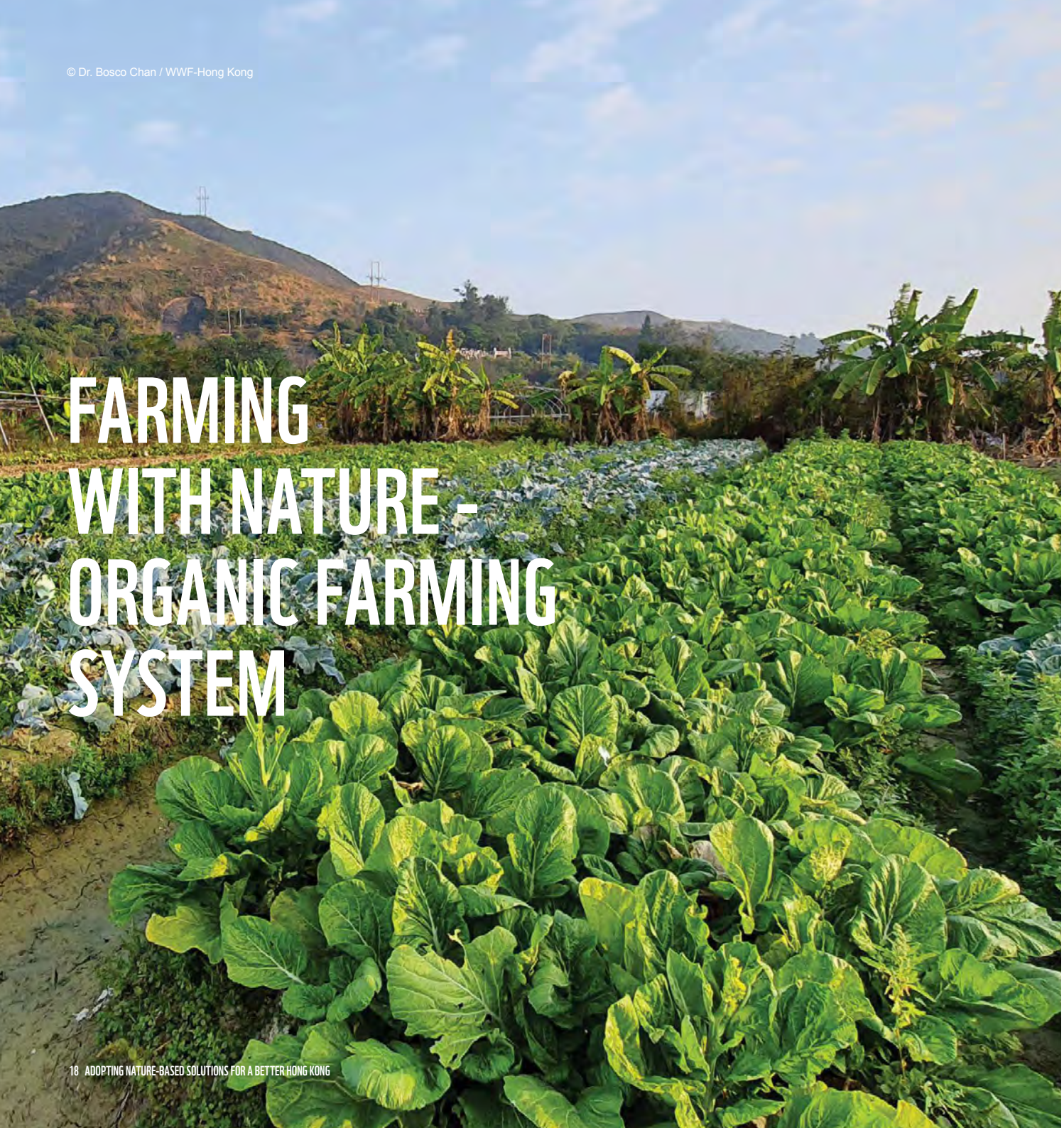
RECOMMENDATIONS TO MAINSTREAM OR SCALE UP THIS TYPE OF NBS

In view of the escalating threat of wetland degradation in Hong Kong, enhanced efforts in conserving and restoring wetlands is paramount. Well protected wetlands embracing the MPNR model (with inclusive governance, a management committee consisting of stakeholders experienced in wetland management, established monitoring and evaluation systems and iterative risk assessment for adaptive management) should be considered for sites with similar natural features in Hong Kong.

1

Enhance understanding of the invaluable contributions of wetlands to society by commissioning research on their capacity to mitigate flood risks and storm surges. Explore the feasibility of integrating wetlands into flood prevention plans alongside traditional grey infrastructure.

2



FARMING WITH NATURE – ORGANIC FARMING SYSTEM

CASE STUDY

Globally, the need for a robust food system has surged in recent decades, a trend that is likely to persist as populations rise and climate change effects persist. However, the necessary elements for a productive agroecosystem, i.e. healthy lands and soils and clean water supply, are already under tremendous strain. Organic farming fosters a sustainable food production system that promotes long-term soil health, improves water quality, and reduces environmental footprint of agriculture, ultimately fortifying the resilience of the food system in the face of climate change pressures.

Due to growing concerns about food safety and environmental protection, organic farming has been gaining popularity in Hong Kong since the 1990s, with the number of organic farms participating in the government's Organic Farming Support Service increasing 23-fold over the past two decades (from 15 to 353 as of 28 October 2023). However, the organic farming industry in Hong Kong remains fairly niche as the city continues to rely for the most part on imported crops[5].

The 0.13 ha Chun Kwan Organic Farm in Tai Po, New Territories, has been owned and managed by a farmer since 2010.

CHUN KWAN ORGANIC FARM AS AN NBS

- The farm is organically certified and implements environmental-friendly practices, such as:
  - soil erosion control;
  - soil enrichment using organic compost;
  - manual pest removal;
  - crop rotation and polyculture; and
  - soil and water conservation.
- Climate resilience of the farm is enhanced by emphasising crop diversity (despite its small size, the farmer cultivates over 60 different crops) and adopting seed saving (as crop varieties adapted to local climates are likely to be more resilient).
- Regular monitoring of soil, water, and pests is conducted for adaptive farmland management.
- Participating in programmes run by universities, government, and certifying bodies facilitates knowledge exchange and aids problem-solving.
- The concept of organic farming is promoted by the farmer by sharing her knowledge and knowhow with the local farming community and customers at farmers' markets.
- As an organically certified farm in Hong Kong, technical and marketing support is provided by the government and social enterprises, helping the farmer increase economic returns. Availability of such support also attracts conventional crop farmers and industry outsiders to join the organic farming movement.

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BIODIVERSITY NET GAIN

Organic farming is more beneficial to biodiversity conservation compared to conventional farming. By avoiding the use of synthetic pesticides and fertilisers, organic farming eliminates the impacts of water and soil contamination, thereby improving ecosystem health to support higher biodiversity.

CO-BENEFITS FOR ENVIRONMENT AND HUMAN WELL-BEING

Climate change mitigation: farm soils sequester and store carbon. Increased local food production reduces carbon footprint associated with importing food.

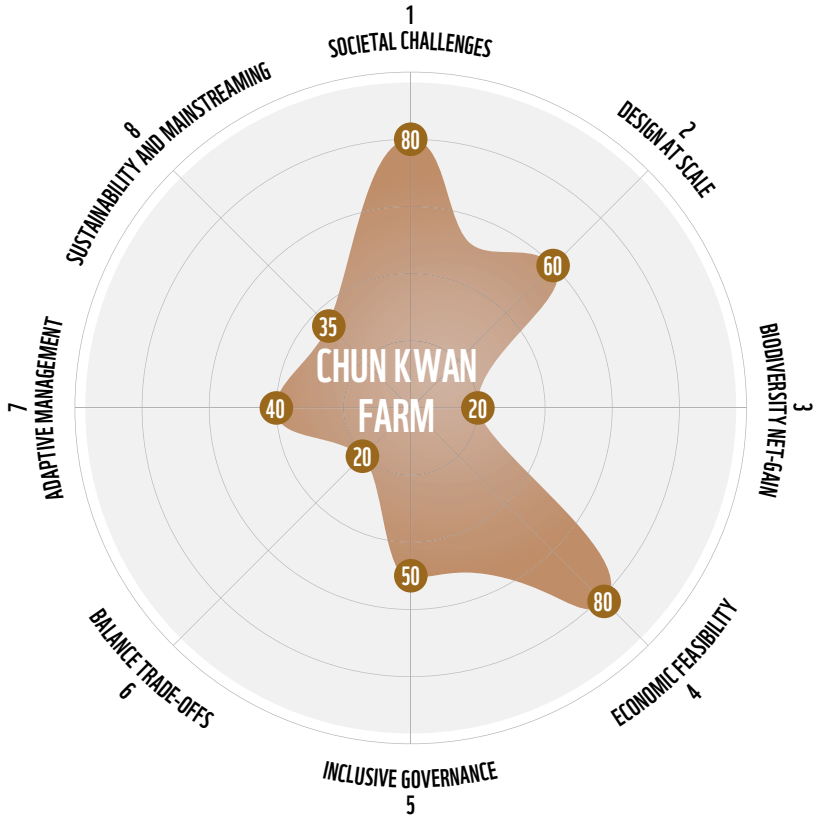
Improved health: crops free from synthetic pesticides and herbicides present healthier food choices.

Local economic development: supporting local organic production creates localised food economies, keeping more money within communities and boosting local economic activity.

Food security and resilience: growing a diverse range of crops helps hedge risks from various threats and improves resilience of production, thereby stabilising local food supply.

Water security: open-field soil with high organic matter content has stronger water holding capacity and acts as a sponge to retain moisture, aiding crop growth and reducing watering demand.

IUCN GLOBAL STANDARD FOR NBS: SELF-ASSESSMENT



Although the intervention tackles significant societal challenges (Criterion 1) and is economically viable (Criterion 4), the total percentage match for this particular organic farm (46%) has been brought down by scoring low in Criteria 3 and 6 and partially meeting Criteria 5, 7, and 8.

- As a small-holding organic farm, it has limited resources to spend on the requisite labour, finance, and monitoring for adaptive management (Criterion 3) and limited capacity to either participate in collective decision- making with other stakeholders (Criterion 5) or assess the impact of interventions beyond the site (Criterion 6).
- Like many other peri-urban organic farms, which are small, scattered and/or fragmented by conventional farming systems and other land uses, this farm faces challenges in identifying actions to enhance ecosystem integrity and connectivity (Criterion 3).
- Under a development-led administration, there is no cohesive agricultural policy framework that support the mainstreaming of organic farming (Criterion 8). This obstacle surpasses the capacity of any individual small-scale farm to address on its own.

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RECOMMENDATIONS TO MAINSTREAM OR SCALE UP THIS TYPE OF NBS

1

The government and NGOs can empower small-holding organic farms by providing knowledge, training, and sharing opportunities. For instance, guidance on monitoring agroecosystem health would enable organic farmers to better understand ecosystem dynamics, assess the impacts of their practices, and make informed decisions to enhance biodiversity conservation in agricultural landscapes.

2

Development of a multi-stakeholder platform for organic farming and agro-biodiversity conservation would enhance communication, understanding, and cooperation among different sectors, promote dialogue between farmers, planners, landowners, researchers, NGOs, policy makers, and businesses to facilitate landscape-level planning and large-scale implementation of organic farming.

3

Supportive land and agriculture policies should be implemented by the government to mainstream organic farming. This can include designating Agricultural Priority Areas to conserve high-quality farmlands facing developmental risks. If high-quality farmland used for organic farming is protected, more individuals are likely to engage in farming either recreationally or professionally. Specifically, the government should promote organic farming in the new Agricultural Park.

4

Each organic farm should develop its own annual management and monitoring plan to improve risk management and facilitate adaptive management.

ENHANCING THE MANAGEMENT OF MARINE PROTECTED AREAS THROUGH CORAL RESTORATION

POTENTIAL PROJECT

Historically, the Tolo Harbour and Channel in Tai Po was an important fish nursery ground and had an estimated 80% coral coverage prior to unchecked pollution, unregulated fishing, and the development of New Towns. Consequently, the bay's coral communities have been almost eradicated and fish populations have been decimated. Several other local sites that once supported thriving coral communities have suffered severe degradation due to multiple stressors including lack of protection[6], water pollution[7], bioerosion[8], and unregulated activities[9]. Despite some progress in mitigating threats, such as water quality, the natural recovery of damaged coral communities is poor[10].

There are ample opportunities for Hong Kong to contribute towards the global targets of protecting 30% of the world's oceans and effectively restoring 30% of degraded marine ecosystems by 2030[11]. Achieving this goal necessitates the expansion and effective management of the Marine Protected Areas (**MPAs**)[12] network in Hong Kong. Coral communities have aptly been termed "underwater rainforests" due to their exceptional biodiversity. By incorporating restoration of coral communities into the design and management of MPAs we can proactively enhance coral coverage, marine biodiversity, and overall marine health over time. This, in turn, benefits commercial fisheries and supports green jobs such as MPA personnel and in the ecotourism industry.

In the case of Tolo Harbour and Channel, restoring its coral communities would not only revitalise the marine ecosystems, but also increase its economic potential by safeguarding employment opportunities for coastal communities.

BIODIVERSITY NET GAIN

Corals provide shelter and food for a diverse array of marine organisms. The overall health of the marine ecosystem would improve as a result of healthy coral and the associated biotic communities

PROTECT **30%** OF WORLD'S OCEANS × RESTORE **30%** OF DEGRADED MARINE ECOSYSTEMS

BY 2030

STAKEHOLDER ENGAGEMENT AND COLLABORATION

NGOs | Academics | Corporates | Fishermen groups | Water sports industry

CO-BENEFITS FOR ENVIRONMENT AND HUMAN WELL-BEING

GROWTH OF GREEN TOURISM AND EMPLOYMENT

Proactive coral restoration would enhance the natural beauty of the bay, supporting the growth of local green tourism industry while also creating and sustaining green jobs in maintaining and monitoring the restored coral communities

HUMAN WELLBEING

The creation of MPAs not only safeguards marine ecosystems but also offers recreational opportunities like kayaking and snorkeling, allowing participants to reap the benefits of exercising in nature

REVITALISE FISHERY SUPPLY

Rebuilding coral community health would help increase the abundance and diversity of seafood species

TOLO HARBOR AND CHANNEL

SUGGESTED ACTIONS TO IMPLEMENT THIS NBS

1

Due to its historical significance as a fish nursery ground, the Tolo Harbour and Channel should be protected as a Fisheries Protection Area (**FPA**), a specialised type of MPA, to safeguard both the fishery resources and the marine environment including coral communities. To ensure the effective protection of restored sites, it is required to implement appropriate measures to minimise identified stressors such as bioerosion.

2

Coral restoration at Tolo Harbour and Channel should be conducted as part of the establishment of the FPA/MPA. Doing so would create a favourable environment to support a thriving and attractive marine ecosystem, which would benefit the fishery and ecotourism industries.

3

A communication platform on implementing marine NbS should be launched to engage stakeholders including the government, academics, environmental NGOs, local communities, industry players (such as fishermen and ecotourism groups) and businesses to encourage sharing of expertise, align visions and efforts, foster cooperation and share lessons learned. Due to the need for legal designation of MPAs, such initiatives must be led by the government. Strategic partners should be engaged to conduct baseline studies, engage stakeholders, educate the public, develop and adjust monitoring and enforcement plans as necessary.

4

The involvement of local communities and the general public in coral restoration should be encouraged, for instance by rolling out hands-on education programmes and workshops, to promote appreciation of local marine biodiversity and nurture proper behaviour when engaging in marine recreational activities.

5

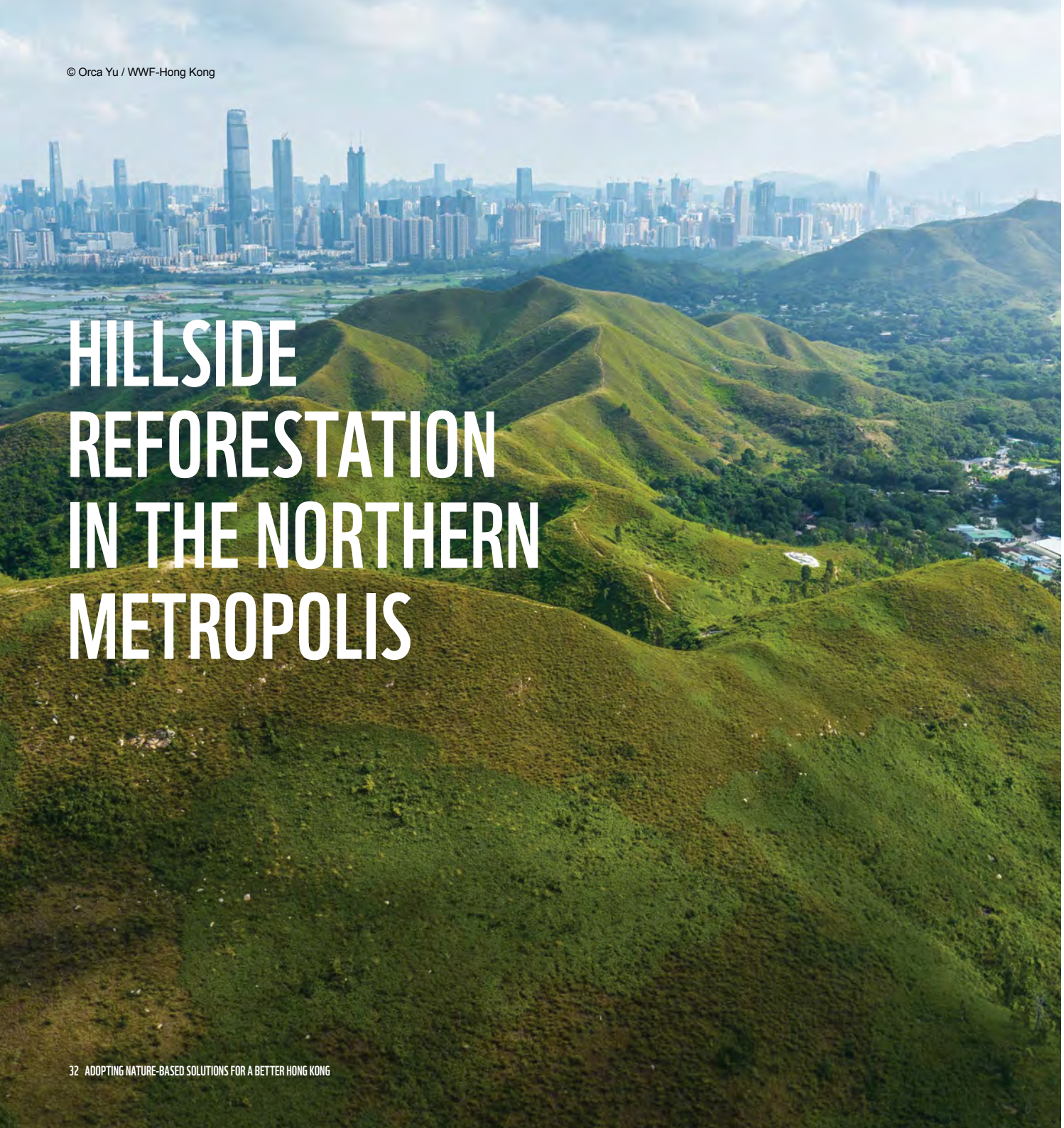
In addition to Tolo Harbour and Channel, local experts and green groups have been calling for the protection of more marine ecological hotspots, including Shui Hau Bay, Pak Nai coast, the Ninepin Group, and Port Shelter[13]. The government should take active steps to establish effective MPAs at ecologically important sites and implement proactive habitat restoration efforts in degraded areas.

6

Active restoration efforts should be accompanied by long-term conservation initiatives to realise the full, long-term ecological and societal benefits of proactive coral restoration.

7

On a regional scale, collaborative cross-border conservation across the Greater Bay Area should be considered – scaling up conservation efforts would maximise benefits to both marine biodiversity and society.



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HILLSIDE REFORESTATION IN THE NORTHERN METROPOLIS

POTENTIAL PROJECT

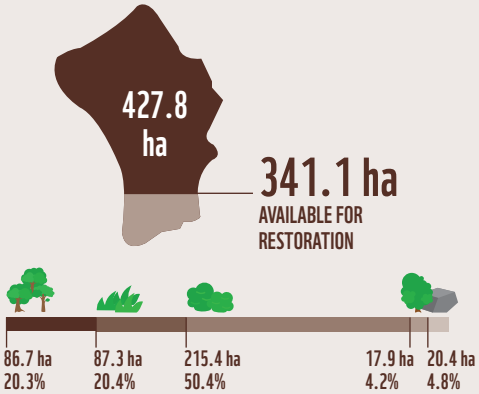
The government's Northern Metropolis (**NM**) Development Strategy[14] covers New Towns, New Development Areas (**NDAs**) and extensive countryside across the northern New Territories, totalling an area of around 30,000 ha. One of the "key action directions" of this strategy is to make NM a "Sustainable Community for Living in and Working". The rich wetland resources in NM have been highlighted in achieving this goal through adoption of a sponge city concept. However, the extensive hill network that straddles the entire NM area and covers a total area of over 2,500 ha (Diagram 1) has not been adequately considered in this strategy. These hills are located outside existing protected areas and are frequently burnt. According to the latest vegetation map of Hong Kong[15], an estimated 1,280 ha of shrubland and 620 ha of grassland (which are secondary habitats and maintained by human-induced wildfires) exist across these hillsides within NM (Figure 1). Reforesting these degraded hillsides with native tree species could serve as an important NbS complementary to wetland conservation in NM by enhancing biodiversity recovery, ecosystem services, and quality of countryside recreation. Being in, or simply viewing, nature has been shown to reduce stress, improve mood and support rehabilitation, benefitting both visitors and the neighbouring community. Reforestation would also improve local air quality while mitigating the urban heat island effect by lowering surface and atmospheric temperatures.

Figure 1.Tit Hang Shan near the Lok Ma Chau Loop is dominated by fire-maintained grassland which is typical of the hillsides of NM.

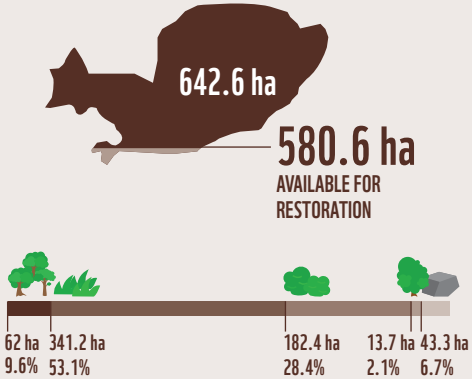
DIAGRAM 1

THE AREAS OF VARIOUS VEGETATION TYPES ON THE HILLSIDES OF NM

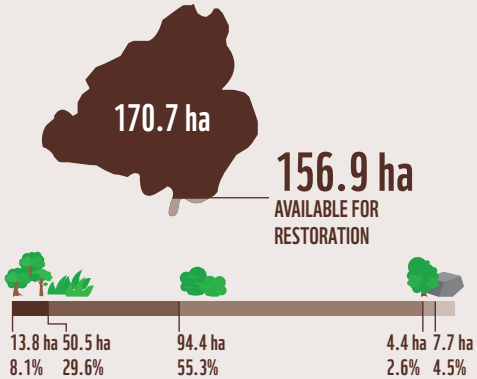
WEST OF HUNG SHUI KIU
洪水橋



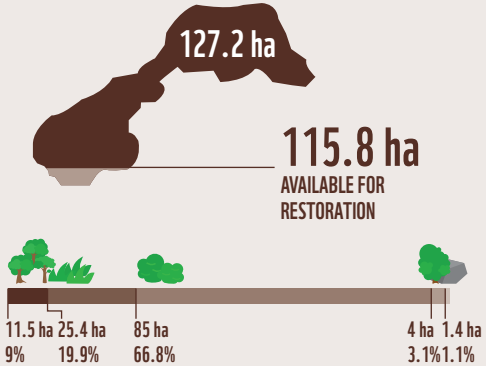
KAI KUNG LENG
雞公嶺



TIT HANG SHAN
鐵坑山



TAI SHEK MO
大石磨



Source: Kwong I.H.Y., Wong, F.K.K., Fung, T., Liu, E.K.Y., Lee, R.H. and Ng, T.P.T. 2022. A Multi-Stage Approach Combining Very High-Resolution Satellite Image, GIS Database and Post-Classification Modification Rules for Habitat Mapping in Hong Kong. Remote Sens. 2022, 14, 67. https ://doi.org/10.3390/rs14010067

NEARLY

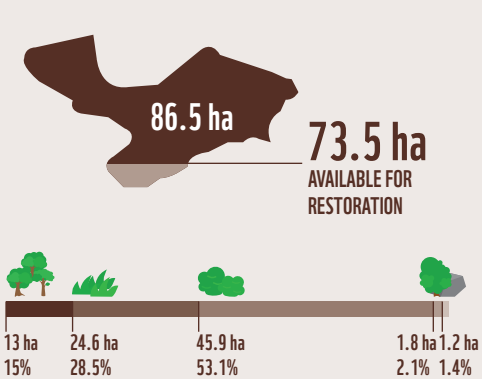
2,000 ha

OF THESE HILLSIDES COULD POTENTIALLY BE REFORESTED

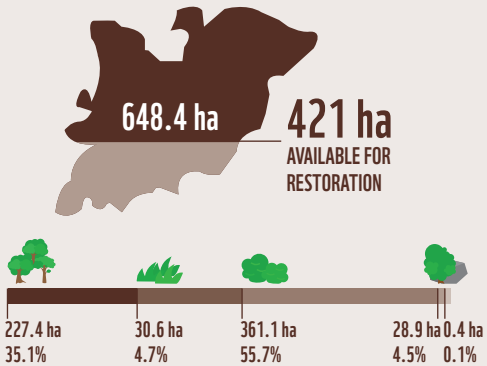
NGAU TAM SHAN
牛潭山

KI LUN SHAN
麒麟山

WA SHAN
華山



ROBIN'S NEST
紅花嶺



BIODIVERSITY NET GAIN

Reforestation of these hillsides with native forest would significantly enhance biodiversity in this area by restoring habitats, supporting the survival of plant and animal species, and contributing to the overall health and resilience of ecosystems

CO-BENEFITS FOR ENVIRONMENT AND HUMAN WELL-BEING

CLIMATE CHANGE MITIGATION

Reforestation of these 1,980.6 ha of hillsides would result in an estimated total gain of 339,000 tonnes of tree and soil carbon

DISASTER RISK REDUCTION

Together with wetlands, reforestation of secondary grasslands could reduce flood risk in NM through root reinforcement of soil structure and reduced surface runoff and soil erosion. Reforestation would also gradually reduce the risk of hill fires as closed canopy tropical forests (as found in Hong Kong) are naturally resistant to fire. Forested hill slopes could also reduce the risk of landslides

GROWTH OF GREEN EMPLOYMENT

Public funding in green infrastructure projects would drive economic development and job creation through skilled labour opportunities in forestry and forest restoration activities

WATER SECURITY

Irrigation water supply in NM (e.g. Kwu Tung Irrigation Reservoir) would benefit from reduced surface runoff and increased infiltration into the soil profile and groundwater

COMMUNITY ENGAGEMENT AND EDUCATION

Engaging the public as volunteers in restoration efforts could help foster community involvement, education, and stewardship of natural areas

FOOD PRODUCTION

Existing orchards that border villages and the Fung Shui Wood would benefit by virtue of increased habitat connectivity and biodiversity

OUTDOOR RECREATION

New opportunities for healthy activities in nature such as hiking

NORTHERN METROPOLIS

SUGGESTED ACTIONS TO IMPLEMENT THIS NBS

1

The hills of the respective New Towns and NDAs in NM should become a major landscape feature.

2

Hong Kong has valuable experience with successful hillside reforestation and should therefore conduct an assessment of the fire history of each hill to inform the design of appropriate planting regimes and fire control protocols tailored to each site's conditions and risks.

3

It is imperative to use native tree species in order to restore local biodiversity and ecosystem functioning. As with other government-funded conservation projects, NGOs could be engaged to set up tree nurseries, carry out reforestation efforts and manage these reforestation sites.

4

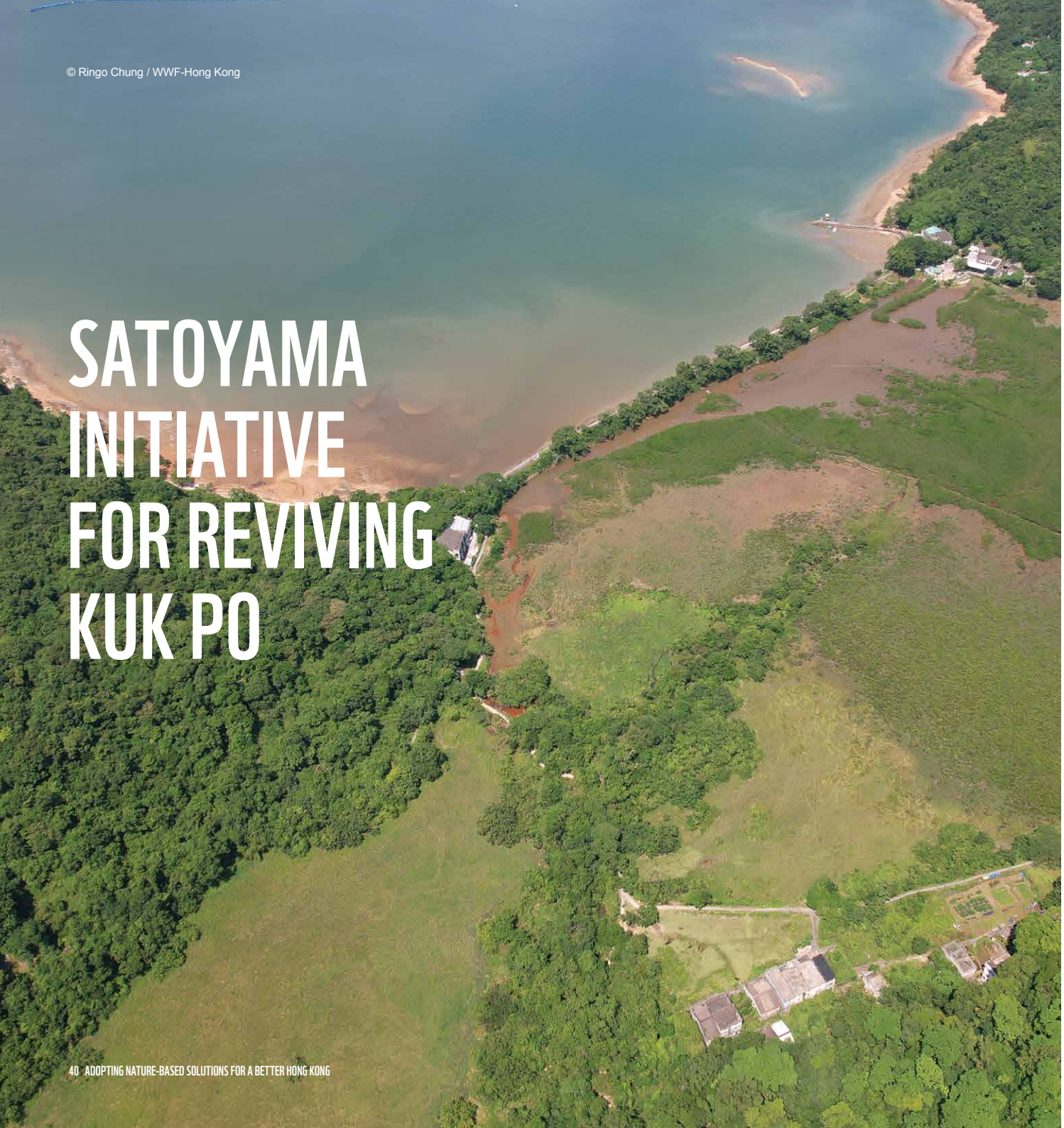
Given the rapid development of ESG considerations in the business sector, there is immense potential for corporate investment in reforestation initiatives. Businesses should ensure they follow the mitigation and conservation hierarchy[15] and strive for high quality NbS.

5

Many members of the public are interested in nature stewardship activities as demonstrated by the popularity of tree planting events in Hong Kong. The public could be trained to assist with reforestation implementation or environmental education as skilled volunteers. Meaningful community engagement is important for fostering local support and ensuring successful long-term management.

6

The reforestation sites created through this NbS could also provide off-site compensation opportunities for trees and forests unavoidably destroyed or impacted by development projects where in-situ compensation or mitigation is not possible.



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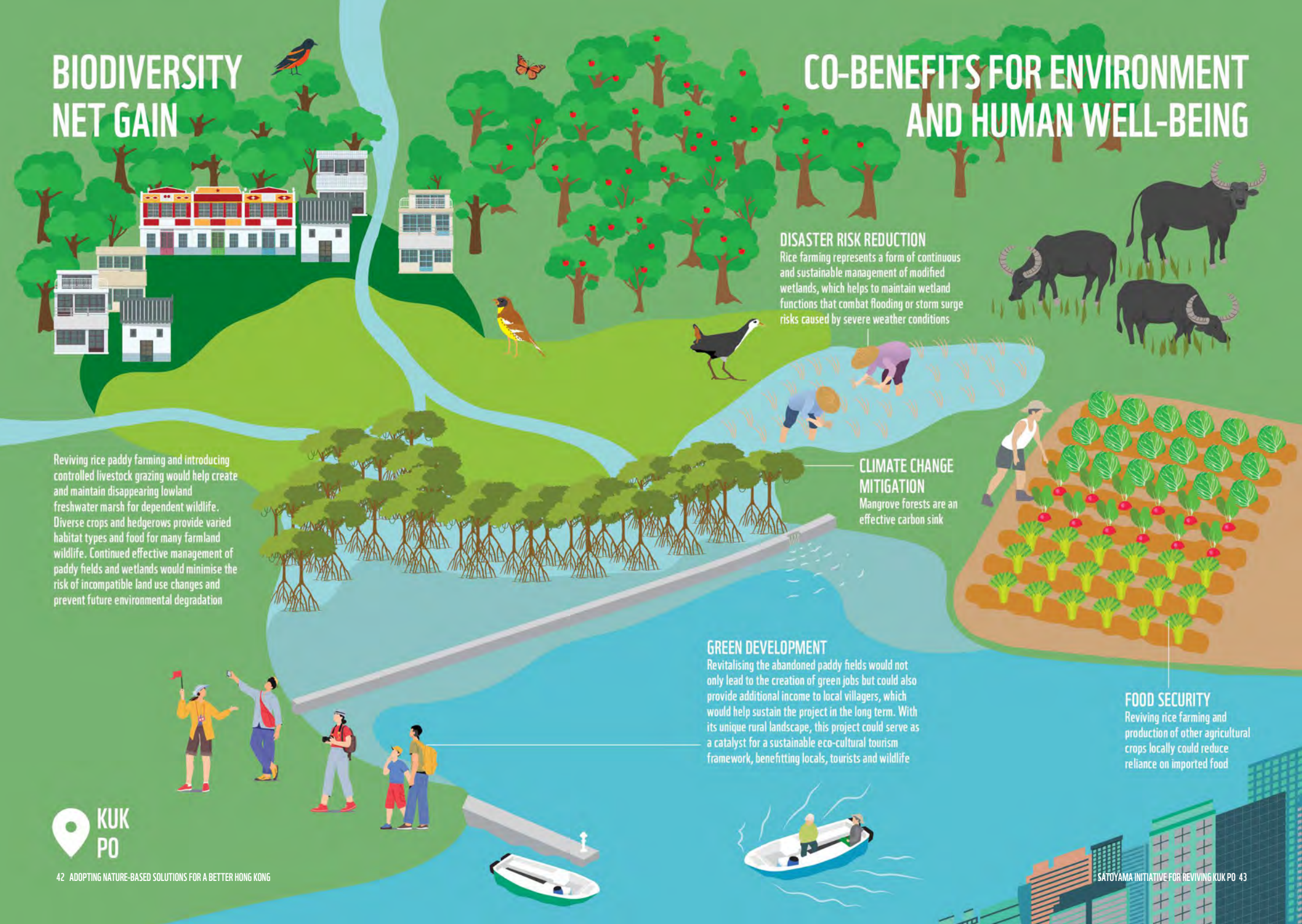
SATOYAMA INITIATIVE FOR REVIVING KUK PO

POTENTIAL PROJECT

Kuk Po, a remote coastal basin located in the northeastern corner of Hong Kong, is an enclave site of 62 ha inside Plover Cove Country Park. The area comprises a range of natural habitats from ridge to reef, including secondary woodland, Fung Shui woodland, shrubland, lowland wetlands (including freshwater and brackish marshes, intertidal mudflats, mangroves, reedbeds, and a stream of ecological importance) and rocky/sandy shores. Due to its diverse and visually appealing landscape, Kuk Po is a very popular hiking destination.

Kuk Po was home to about five hundred Hakka villagers up to the 1950s, with rice farming as their main livelihood. The paddy fields were established by constructing a dam across the shallow bay, which prevented the influx of seawater and created conditions suitable for rice growing. These paddy fields and other farmlands offered secure food sources for the locals and served as favourable habitats for farmland wildlife. The sustainable coexistence of local villagers and nature in Kuk Po is an excellent example of a Satoyama landscape, which emphasises the harmonious relationship between people and their environment.

Since the industrialisation of Hong Kong around the late 1960s, almost all villagers left Kuk Po and farming activities were abandoned. As a result, the extensive abandoned paddy fields have been left unmanaged for over five decades, leading to minimal productivity and declining biodiversity. The rapid loss of lowland open country landscapes and their associated biodiversity in Hong Kong is a worrying trend, making the sustainable management of such sites an important local NbS. Revitalising Kuk Po as a Satoyama landscape would offer a unique opportunity to demonstrate an ecosystem that simultaneously promotes sustainable land use practices, conserve biodiversity, and foster cultural preservation and community resilience.


BIODIVERSITY NET GAIN
CO-BENEFITS FOR ENVIRONMENT AND HUMAN WELL-BEING
DISASTER RISK REDUCTION
Rice farming represents a form of continuous and sustainable management of modified wetlands, which helps to maintain wetland functions that combat flooding or storm surge risks caused by severe weather conditions
Reviving rice paddy farming and introducing controlled livestock grazing would help create and maintain disappearing lowland freshwater marsh for dependent wildlife. Diverse crops and hedgerows provide varied habitat types and food for many farmland wildlife. Continued effective management of paddy fields and wetlands would minimise the risk of incompatible land use changes and prevent future environmental degradation
CLIMATE CHANGE MITIGATION
Mangrove forests are an effective carbon sink
GREEN DEVELOPMENT
Revitalising the abandoned paddy fields would not only lead to the creation of green jobs but could also provide additional income to local villagers, which would help sustain the project in the long term. With its unique rural landscape, this project could serve as a catalyst for a sustainable eco-cultural tourism framework, benefitting locals, tourists and wildlife
FOOD SECURITY
Reviving rice farming and production of other agricultural crops locally could reduce reliance on imported food
KUK PO

SUGGESTED ACTIONS TO IMPLEMENT THIS NBS

1 A stakeholder analysis should be conducted for Kuk Po to create a shared vision among local and external stakeholders.

2 The Kuk Po landscape should adopt the land management concept of Satoyama, while considering its synergistic position in NM.

3 The paddy-derived marshes and intertidal wetland should be actively managed for the benefit of local villagers as well as biodiversity.

4 Low-impact farming practices such as paddy, vegetable, and orchard cultivation are recommended as one of the sustainable ways to manage part of the abandoned agriculture fields.

5 Controlled livestock grazing, such as the use of water buffalo, is recommended for the sustainable management of Kuk Po's marshland. The continuous grazing and wallowing of the buffalo create favourable wildlife habitats and mitigates wetland terrestrialization (i.e. the process by which wetland changes into terrestrial ecosystem) thereby maintaining a functional and healthy wetland.

6 The Starling Inlet area has been identified by the government for ecotourism development. Low-key and low-impact visitor infrastructures such as viewing decks, boardwalks and birdwatching hides/screens should be provided to safeguard the safety and experience of visitors, while minimising disturbance towards the wetland and wildlife.

7 Most of the agricultural fields that are currently abandoned are under private ownership. These landowners may or may not have the intention or financial ability to sustainably manage their lands and align land use with their original planning intention (i.e. for agricultural purposes). The government should acknowledge the significant potential of these areas in providing ecosystem services by allocating sufficient budget to support the implementation of a sustainable land management model.

8 To facilitate the recruitment and stability of the labour force in farmland revitalisation efforts in Kuk Po, restoration of village houses and provision of essential infrastructure would be needed.

9 Tourism levels must be carefully monitored and, if needed, controlled to avoid exceeding the ecological carrying capacity of the area. Sustainable tourism management practices should be adopted to maximise community and ecological benefits to prevent degrading the rural landscape.

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RECOMMENDATIONS

There are ample opportunities to implement NbS in Hong Kong to support biodiversity conservation, human health, sustainable development, climate change mitigation and disaster risk reduction. Ensuring the effective, equitable and widespread implementation of NbS requires an integrated policy framework across social and economic sectors. Key actions should include:

1
ALIGN POLICIES ACROSS SECTORS TO SUPPORT NBS

Agree on and adopt the UNEA definition (and associated standards and guidelines) for NbS to avoid "greenwashing" of projects that do not adequately protect nature or negatively impact vulnerable communities.

Analyse how activities impact ecosystems to identify and address potential conflicts between legal frameworks and the adoption of NbS.

2
MOBILISE AND ALLOCATE SUFFICIENT RESOURCES BEYOND ENVIRONMENTAL INSTITUTIONS' BUDGETS TO INCENTIVIZE AND REWARD NBS ACROSS SECTORS

Integrate NbS into the government's annual budget by ensuring adequate financial and human resources are allocated to mainstream NbS within development plans for Hong Kong.

Provide access to capital to sustainably manage and rehabilitate ecosystems via green bonds, loans, and opportunities for public private partnerships.

Repurpose finance that drives nature conversion and environmentally damaging subsidies towards sustainable and environmentally friendly practices.

Provide business incubation (i.e. advice, training, funding, and/or market access) for new NbS projects.

3
SUPPORT PRACTICAL IMPLEMENTATION OF NBS

Address existing knowledge gaps through research, stakeholder engagement and pilot projects to identify viable NbS suited to the local landscape and seascape, produce targeted guidance and digital knowledge platforms, and foster collaboration and knowledge sharing between different government departments, businesses, academia and NGOs by hosting events for discussion and exchange.

Mandate climate resilience assessments in spatial planning decision-making and the design phase of project developments and promote the use of NbS as adaptation and mitigation strategies over traditional engineering approaches by providing technical knowledge and assistance.

Mandate accurate valuation of ecosystem services and accounting methodologies for the systematic assessment of proposed land use changes in natural and modified habitats, including trade-offs and opportunities.

Establish regulations to protect and sustainably manage green and blue infrastructures (e.g. ecological corridors, mangroves, marshes, forest blocks, waterways and water bodies, high-value farmlands) and prevent further land conversion.

Establish SMART (Specific, Measurable, Achievable, Realistic, and Timely) monitoring and evaluation systems with target-setting, as well as clear and consistent disclosure to assess the effectiveness and impact of NbS (via standardised social and environmental indicators, e.g. weather stations, tide gauges, satellite imagery) and support scaling up of pilot programmes alongside regular reviews and updates to policies and strategies based on the outcomes and lessons learned from implementation.

APPENDIX I
ABBREVIATIONS AND REFERENCES

EAAF	East Asian-Australasian Flyway
EIA	Environmental Impact Assessment
ESG	Environmental, Social, and Governance
IUCN	International Union for Conservation of Nature
NbS	Nature-based Solutions
NGO	Non-Governmental Organisation
NM	Northern Metropolis
UNEA	United Nations Environment Assembly

[1] Resolution 5 of the Fifth Session of the United Nations Environment Assembly of the United Nations Environment Programme.

[2] Pérez-Cirera, V., Cornelius, S. and Zapata, J. Powering Nature: Creating the Conditions to Enable Nature-based Solutions. WWF. 2021. https://lp.panda.org/powering-nature-report

[3] https://portals.iucn.org/library/sites/library/files/documents/2020-020-En.pdf

[4] https://www.birdlife.org/globalflyways/

[5] In 2021, only 2% of the vegetables consumed by Hong Kong people came from local farms (Hong Kong: The Facts. Agriculture and Fisheries. July 2022. Agriculture, Fisheries and Conservation Department, HKSAR Government https://www.gov.hk/en/about/abouthk/factsheets/docs/agriculture.pdf)

[6] WWF-Hong Kong. (2022). A Roadmap for Ocean Conservation for Hong Kong. https://wwfhk.awsassets.panda.org/downloads/ocean_conservation_roadmap_for_hk_for_hkmpa_with_cover.pdf?fbclid=IwAR212fobfJ1xFRkGvdR9ADe25Qx1Wl1s_CcTH-cFk95viCzJq2YYe7x_gxc

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[13] WWF-Hong Kong. (2022). A Roadmap for Ocean Conservation for Hong Kong. https://wwfhk.awsassets.panda.org/downloads/ocean_conservation_roadmap_for_hk_for_hkmpa_with_cover.pdf?fbclid=IwAR212fobfJ1xFRkGvdR9ADe25Qx1Wl1s_CcTH-cFk95viCzJq2YYe7x_gxc.

[14] Hong Kong Special Administrative Region Government (2021) Northern Metropolis Development Strategy Report. https://www.policyaddress.gov.hk/2021/eng/pdf/publications/Northern/Northern-Metropolis-Development-Strategy-Report.pdf

[15] Kwong I.H.Y., Wong, F.K.K., Fung, T., Liu, E.K.Y., Lee, R.H. and Ng, T.P.T. 2022. A Multi-Stage Approach Combining Very High-Resolution Satellite Image, GIS Database and Post-Classification Modification Rules for Habitat Mapping in Hong Kong. Remote Sens. 2022, 14, 67. https://doi.org/10.3390/rs14010067

[16] First (1) avoid and then (2) minimise impacts as far as possible then (3) restore/remediate impacts that are immediately reversible and, finally (4) offset any residual impacts to achieve a desired net outcome (usually no net loss or net gain)
For more information, see https://conservationhierarchy.org/what-is-conservation-hierarchy/

APPENDIX II
CRITERIA AND GUIDANCE FROM THE IUCN GLOBAL STANDARD FOR NATURE-BASED SOLUTIONS

CRITERION 1
NBS EFFECTIVELY ADDRESS SOCIETAL CHALLENGES

The purpose of this Criterion is to ensure that the NbS is designed as a response to a societal challenge(s) that has been identified as a priority by those who are or will be directly affected by the challenge(s). All stakeholders, especially rights holders and beneficiaries of the NbS, must be involved in the decision-making process used for identifying the priority challenge(s) (Criterion 5).

CRITERION 2
DESIGN OF NBS IS INFORMED BY SCALE

The purpose of this Criterion is to encourage NbS designs that recognise the complexity and uncertainty that occur in living dynamic land/seascapes. Scale applies not only to the biophysical or geographic perspective but also to the influence of economic systems, policy frameworks and the importance of cultural perspectives.

NbS design will be informed by what stakeholders know about the interactions between different aspects of a land/seascape using a three-scale framework that considers the parts within the land/seascape; the land/seascape itself; and the wider environment around the land/seascape. One example would be households within villages within a local authority area. Understanding the interactions which affect attributes like cultural values, laws, soils, forests and water are important in this regard, as they are relevant to the assessment of the risk of undesirable change, or the probability of creating desirable change.

NbS design seeks to maintain the productive capacity of ecosystems as well as the production of benefits necessary for human well-being.

CRITERION 3
NBS RESULT IN A NET GAIN TO BIODIVERSITY AND ECOSYSTEM INTEGRITY

NbS are derived as goods and services from ecosystems, therefore strongly depend on the health of an ecosystem. Biodiversity loss and ecosystem change can have significant impacts on the functioning and integrity of the system. Therefore, NbS design and implementation must avoid undermining the integrity of the system and instead, proactively seek to enhance the functionality and connectivity of the ecosystem. Doing so can also ensure the long-term resilience and durability of the NbS.

CRITERION 4
NBS ARE ECONOMICALLY VIABLE

The return on investment, the efficiency and effectiveness of the intervention, and equity in the distribution of benefits and costs are key determinants of success for an NbS. This Criterion requires that sufficient consideration is given to the economic viability of the intervention, both at the design stage and through monitoring the implementation.

For NbS to be sustainable, there must be strong consideration of the economic aspects as, most likely, longterm gains must be balanced against short-term costs, with short-term actions developed within the context of long-term (over generations) goals and plans.

If the economic feasibility is not adequately addressed, NbS run the risk of being short-term projects, where, after closing, the solution and benefits provided cease to exist, potentially leaving the landscape and communities worse off than before.

Innovative and evidence-based tools for the valuation of nature, along with ideas for NbS contributions to markets and jobs, encourage creative (blended) financing of NbS, thereby increasing the likelihood of their long-term success.

CRITERION 5
NBS ARE BASED ON INCLUSIVE, TRANSPARENT AND EMPOWERING GOVERNANCE PROCESSES

This criterion requires that NbS acknowledge, involve and respond to the concerns of a variety of stakeholders, especially rights holders.

Good governance arrangements are proven to not only reduce an intervention's sustainability risks, but also to enhance its social 'license to operate'. Conversely inadequate governance provision for otherwise well-intended actions can adversely affect the legitimacy of benefit and cost sharing arrangements.

At a minimum, NbS must adhere to and align with the prevailing legal and regulatory provisions, being clear on where legal responsibilities and liabilities lie. However, as often is the case with natural resources, basic compliance will need to be complemented with ancillary mechanisms that actively engage and empower local communities and other affected stakeholders.

CRITERION 6
NBS EQUITABLY BALANCE TRADE-OFFS BETWEEN ACHIEVEMENT OF THEIR PRIMARY GOAL(S) AND THE CONTINUED PROVISION OF MULTIPLE BENEFITS

Trade-offs in land and natural resource management is inevitable. Ecosystems provide a wealth of different benefits and not everyone values each of them in the same way. While tradeoffs cannot be avoided, they can be effectively and equitably managed. This Criterion requires that NbS proponents acknowledge these tradeoffs and follow a fair, transparent and inclusive process to balance and manage them over both time and geographic space.

This involves a credible assessment, full disclosure and agreement among the most affected stakeholders on how the trade-offs should be addressed. Fair and transparent negotiation of trade-offs and compensation among potentially affected parties for any damages or trade-offs to local opportunities and livelihoods provides the basis for successful long-term NbS outcomes.

Critically, it is important to recognise that tradeoffs have social and ecological limits beyond which point certain values or benefits can be lost in perpetuity. This means that safeguards will be necessary to ensure, inter alia, that the integrity of ecosystems and the long-term stabilising properties of ecosystem services are not exceeded.

CRITERION 7
NBS ARE MANAGED ADAPTIVELY, BASED ON EVIDENCE

This Criterion requires that NbS implementation plans include provisions to enable adaptive management as a response to uncertainty and as an option to effectively harness ecosystem resilience. A degree of uncertainty is inherent when managing most ecosystems due to their complex, dynamic and self-organising nature. This also means that ecosystems have greater resilience which confers a wider range of options to respond to unanticipated social, economic or climate events.

The foundation of adaptive management is the evidence-base provided by regular monitoring and evaluation, drawing on scientific understanding as well as indigenous, traditional and local knowledge. By proactively adopting an adaptive management approach, the NbS can continue to be relevant through the lifecycle of the intervention and the risk of redundancy and stranded investments minimised.

CRITERION 8
NBS ARE SUSTAINABLE AND MAINSTREAMED WITHIN AN APPROPRIATE JURISDICTIONAL CONTEXT

This Criterion requires that NbS interventions are designed and managed with a view to long-term sustainability and that they take account of, work with and align with sectoral, national and other policy frameworks.

There are various approaches to mainstreaming NbS; however, all rely on strategic communications and outreach. Audiences to consider include individuals (e.g. the public, academics), institutions (e.g. national government, start-ups, businesses, and organisations) and global networks (e.g. Sustainable Development Goals, Paris Agreement).

Source: IUCN Global Standard for Nature-based Solutions : first edition (https://portals.iucn.org/library/node/49070)

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