Chapter Five: Sustainable Landscape Management for Biodiversity Conservation

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From *Taman Negara*'s (National Park) 130-million-year-old mountainscapes to the reef-laden seas spanning 4,006km^2 of the Pacific's Coral Triangle, Malaysia houses over 15,000 flora and 150,000 fauna species across its terrestrial and marine ecosystems.[1] As one of the only seventeen mega-biodiverse countries in the world, these natural ecosystems have long supported our quality of life by providing food and water, shelter, medicines, biomaterials and natural mitigation systems for ecological disasters. Moreover, the conservation of terrestrial and marine areas in Malaysia was recently valued at RM739.12 billion, with the overall global economic value of biodiversity-enabled ecological services estimated at USD150 trillion per year.[2]

Yet, rapid population growth and industrial development threaten the very habitats we rely on for our well-being and livelihood. Extensive agricultural activity, commercial logging and mining and urbanization have resulted in 17 percent of forest cover lost over the last 25 years[3], 27 percent of seashores affected by coastal erosion as of 2020[4] and 899 flora and fauna species classified as endangered.[5] The unprecedented scale of biodiversity loss has and will continue to increase our exposure to disease emergence, clean water shortages, weak crop pollination, ecological disasters and decline in economic productivity.[6]

As a party to the United Nations Convention on Biological Diversity, Malaysia has maintained its commitment to safeguarding biodiversity since the 1990s. Following the establishment of the Global Aichi Targets in 2010, the Government of Malaysia launched the revised National Policy on Biological Diversity (NPBD) 2016-2025 that outlined five national goals supported by seventeen measurable targets. Since 2016, we have observed a series of watershed movements,[1] such as the passing of the 2017 Access and Benefit Sharing Act which recognizes local communities' rights to biological resources and associated traditional knowledge, as well as the first Ecological Fiscal Transfer budgetary allocation in 2019 to address financing gaps for state actors pursuing biodiversity conservation action. As the NPBD nears its maturity in 2025, we reflect on our relationship to our natural ecosystems and ask what lies ahead for biodiversity conservation action?

[1] *Ministry of Water, Land and Natural Resources.* ***"Sixth National Report of Malaysia to the Convention on Biological Diversity."*** *Ministry of Water, Land and Natural Resources, December 2019, https://www.mybis.gov.my/pb/4382#:~:text=Malaysia's%20Sixth%20National%20Report%20to,driven%20and%20gender%2Dinclusive%20reporting. Accessed 10 February 2023.*

[2] *Campaign for Nature.* ***"The Nexus of Biodiversity Conservation and Sustainable Socioeconomic Development in Southeast Asia."*** *Academy of Sciences Malaysia, 15 June 2022, https://www.akademisains.gov.my/asm-publication/nexus-of-biodiversity/. Accessed 10 February 2023.*

[3] *Rahaman, Zullyadini A.* ***"Assessing the impacts of vegetation cover loss on surface temperature, urban heat island and carbon emission in Penang city, Malaysia."*** *Building and Environment, Volume 222, 109335, 15 August 2022, https://www.sciencedirect.com/science/article/abs/pii/S0360132322005686. Accessed 10 February 2023.*

[4] *Adnan, Nor Aizam.* ***"Beach Profile Assessment and Erosion Rate Estimation of Monsoonal Coastline Area in Pahang, Malaysia."*** *IOP Conference Series: Earth and Environmental Science, Volume 799, 30 November 2020, https://iopscience.iop.org/article/10.1088/1755-1315/799/1/012005. Accessed 10 February 2023.*

[5] *International Union for Conservation of Nature (IUCN).* ***"IUCN Red List."*** *IUCN, https://www.iucnredlist.org/search?landRegions=MY&searchType=species. Accessed 10 February 2023.*

[6] *Campaign for Nature.* ***"The Nexus of Biodiversity Conservation and Sustainable Socioeconomic Development in Southeast Asia."*** *Academy of Sciences Malaysia, 15 June 2022, https://www.akademisains.gov.my/asm-publication/nexus-of-biodiversity/. Accessed 10 February 2023.*

In this chapter, we first look at macro-level actions: How the integrated management of commercial forests and agricultural plantations can achieve optimal land use without compromising biodiversity conservation. In line with empowering forest protection mandates, our focus turns to a breakthrough in national fiscal policy that addresses financing gaps for state actors pursuing biodiversity conservation action. We then consider the wider sub-national legislative framework needed to operationalize effective protected area management.

Of equal importance is the need for locally owned nature-based solutions. We showcase how rivers can be protected while generating economic benefits for the communities around them. Next, we explore participant-based experiences in urban-nature integration and how that can shift perceptions and attitudes to build grassroot support. Finally, we look at the value citizen scientists can bring in generating data and communicating stories that enable biodiversity conservation.

5.1
Biodiversity Conservation in Multiple-Use Forest Landscapes in Sabah, Malaysia

Adib, the plantation worker

Adib strolled through the plantation, checking on the young trees. Having worked here for over ten years, he could walk the trail in his sleep. The job has provided a stable, if humble income for his family.

A few years back, walking this very path, he had found himself face to face with an elephant feeding on the fruit at the edge of the plantation. He had seen the signs of the elephants before—damaged trees and muddy footprints but had never come face-to-face with the perpetrator until that day. It had been frustrating work, replanting the trees only to see them being trampled on again. He had thought about chasing the elephant off, but when he finally saw it face to face, he realized just how large it was and was afraid of being injured if he tried. So, he watched from a distance as the elephant fed until it was satiated and finally walked away.

Today, the stretch is protected by electric fences. His plantation manager had installed them when it became clear that the elephants kept coming back. He had heard some people say it was cruel, but they didn't have to clean up after the elephants—or risk coming face-to-face with them. There have been instances where elephants got through the fences, but there has not been significant damage. The fences keep him safe.

Borneo pygmy elephants

A herd of elephants walk by the electric fence by the plantation, looking at the newfound food in there. It had been a long journey walking through the jungle. There was a time when they fed on the very satisfying fruit and shoots that grew along their way. A happy time. A very short time.

It used to be their playground and their feeding site. Until the humans came and changed it. The humans brought the delicious fruit and pasture, but these creatures were also dangerous. They had tools that could hurt and kill the elephants. And a member of their herd died from the food the humans had laid out. It was most despicable of these humans, and elephants have long memories. Still, the humans were too numerous and too powerful to fight. Best to just stay clear of them and their lands.

However, the humans kept claiming more and more land, and their plantations blocked access to other parts of the forest. The herds shrunk as there was not enough food to go around. Then, one day, some paths through the plantations opened up. They were cautious, but they needed to travel to forage for food. Nonetheless, this time, the humans had let them pass undisturbed. An uneasy understanding had formed—stay away from their crops, and the elephants could travel the jungle.

Ignoring the food beyond the fence, they continued walking, assured of the grasses and forest fruit further ahead.

Mr. Tan, the plantation owner

Three years ago, Mr. Tan sat at his desk looking at a proposal for a wildlife corridor through the plantation. The value of the land for a hectare of the plantation was around RM88,000, and it would produce 5 tons of produce each year. The proposed corridor would take up 1,000 hectares of land or about 3 percent of his plantation. A significant amount even for a large plantation like this.

Balanced against the damage the elephants were doing to the plantation, the crop damage of about RM500,000 each year seemed insignificant then, but he cannot risk the danger to his workers. Some had suggested various measures to frighten the elephants away from the plantation, but their ideas sounded risky. Fencing the corridor would be the best alternative. Besides, if the elephants didn't have different food sources and could not travel to forage, they would keep coming. The elephants simply did not have any other options. At the time, he just wished he could be sure the corridor would work as promised.

The good news was that it did work. The plantation and the elephants could co-exist. He was glad that someone had come up with the solution for making that happen.

Robbi, the environmentalist

Robbi has been championing the conservation cause for over a decade, repeatedly advocating that the interest of wildlife must be protected. Speaking to authorities and various stakeholders at a meeting, she stresses, "The plantations complain of crop damage, but this is because of habitat loss due to agriculture and timber concessions. Now, elephants are confined to smaller areas, and so it is only natural that this would result in human-elephant conflict."

She turns her computer screen to face her audience.

"Elephants are accustomed to traditional routes. Here you see the movement of our collared elephants. Quite striking, don't you think? Elephant routes stretch through three big conservation areas, Maliau Basin, Danum Valley and Imbak Canyon, which are production forests involving major licensees and joint venture partners."

Laying out the evidence that the wildlife corridors in Sabah have worked to connect forest reserves, enable movement of animals, and reduce human-wildlife conflict, Robbi proposed similar solutions be deployed in plantations and logging areas elsewhere in Malaysia. She's not sure how long it will take for this presentation to influence and change practices. Nonetheless, the results are evident, and mainstreaming biodiversity into management practices on the ground is non-negotiable.

The **Biodiversity Conservation in Multiple-Use Forest Landscapes** project in Sabah, Malaysia is a Global Environment Facility funded project managed by the United Nations Development Programme and implemented by the Sabah Forestry Department, between June 2012 and December 2019. The project landscape consisted of a contiguous block of connecting land mass between the protected areas of Maliau Basin Forest Reserve, Danum Valley Forest and Imbak Canyon Forest Reserve. Based on evidence from biodiversity-related research on landscape and ground level studies for improving habitat connectivity, the project was successful in modelling improved management for biodiversity conservation.

what lies **within**

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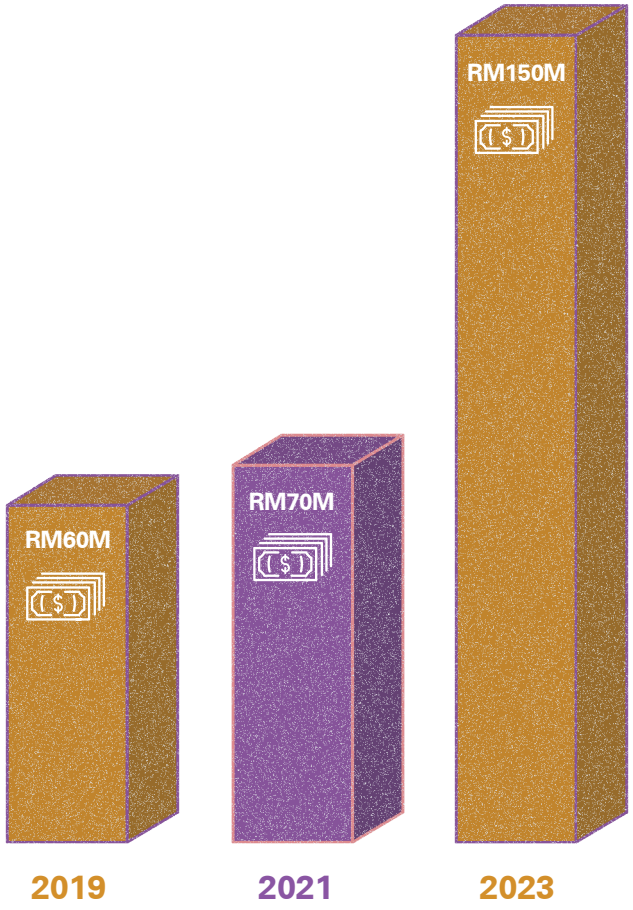
5.2
Tracing Malaysia's Journey Towards Ecological Fiscal Transfer

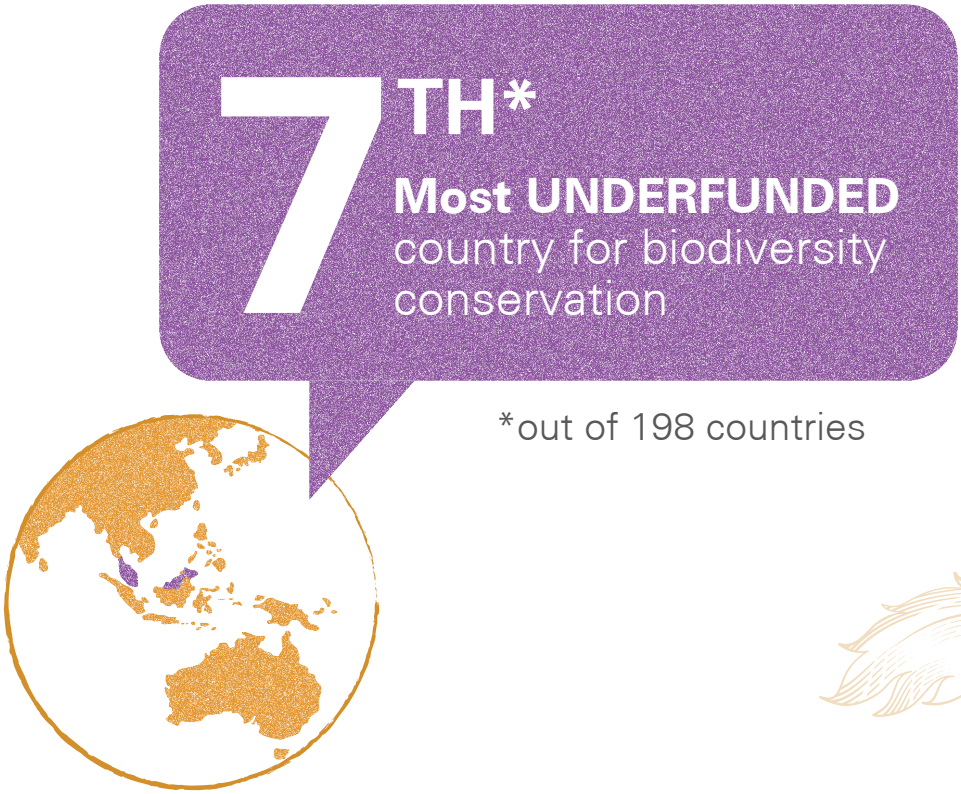
As the world's twelfth most mega-biodiverse country, our health and livelihoods in Malaysia are intimately intertwined with the preservation of forest and marine biodiversity. Threats to the country's biodiversity affect all aspects of our lives, from access to clean water supply to devastating monsoon seasons.[1] In response to this, the Government of Malaysia committed RM60 million of its national budget to ecological fiscal transfers (EFTs) in 2019, increasing the investment to RM70 million in 2021 and to RM150 million in 2023. The landmark endorsement signalled a turning point in addressing financing gaps for state actors pursuing biodiversity conservation action. As a result of the sustained advocacy and engagement by the UNDP together with the Ministry of Economic Affairs, what started as an untapped policy direction graduated into a breakthrough commitment for financing biodiversity conservation.

Malaysia's Ecological Fiscal Transfer Commitment



[1] *Ruiqi, Rachel Teng.* ***"Deforestation intensifies in northern Malaysia's most important water catchment."*** *Mongabay, 28 July 2022, https://news.mongabay.com/2022/07/deforestation-on-the-rise-in-northern-malaysias-most-important-water-catchment/. Accessed 29 January 2023.*

Financing biodiversity conservation is a long-standing issue, with Malaysia previously ranking the seventh most underfunded out of 198 countries.[2] From waste discharge fees to land use taxes, fiscal instruments have increasingly been leveraged in the interest of biodiversity conservation.[3] However, there remained a gap in addressing the significant opportunity cost to state actors implementing biodiversity conservation—especially as land sales and resource extraction are major sources of revenue for state governments. For instance, when forest areas are gazetted, State Governments have less land for commercial activity. In 2022, a state executive councillor for environment cited a RM77 million loss owing to the state administration's 25-year logging moratorium.[4]



[2] *Waldron, Anthony & others.* ***"Targeting global conservation funding to limit immediate biodiversity declines."*** *PNAS, Vol. 110, No. 29, 1 July 2013, https://www.pnas.org/doi/10.1073/pnas.1221370110. Accessed 27 January 2023.*

[3] *See Panayotou, Theodore.* ***"Economic Instruments for Environmental Management and Sustainable Development."*** *United Nations Environment Programme, December 1994, https://core.ac.uk/download/pdf/48031478.pdf. Accessed 29 January 2023.*

[4] *Bendahara, Alang.* ***"Selangor to continue safeguarding its forests."*** *Selangor Journal, 8 July 2022, https://selangorjournal.my/2022/07/selangor-to-continue-safeguarding-its-forests/. Accessed 29 January 2023.*

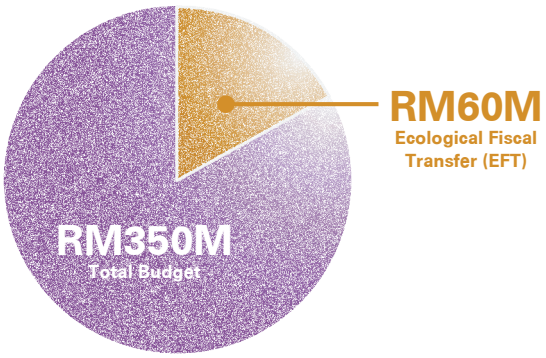
Here, intergovernmental fiscal transfer (IFT) allows for public revenue to be redistributed from Federal to State Governments to address national priorities. IFTs are responsible for financing about 60 percent of subnational expenditures in developing countries and roughly a third in the OECD.[5] Before the 2019 EFT budgetary allocation in Malaysia, IFTs had already been mobilized for other development initiatives, like supporting less populous states with the 2002 Capitation Grant or assisting states whose per capita GDP is below the national average with the 1977 Revenue Growth Grants Act.[6] As of 2021, total IFTs in Malaysia amounted to RM7 billion.[7]

Previously, IFT allocations were driven by traditional economic considerations like population and GDP but not by ecological variables such as area of protected forest cover or quality of watershed management. To this end, EFTs are a formalized environmental grant-making system that encourages decentralized biodiversity conservation action—recognizing that local knowledge and capacity are crucial to success. EFTs not only compensate local governments for lost revenue but can also create an incentive and accountability system for biodiversity conservation.

First established in Brazil in the 1990s, Portugal, France, India and China have followed suit in implementing EFTs, and have seen successful state-led biodiversity conservation action propel national environmental agendas.[8] In Malaysia, the RM60 million commitment to EFT in 2019 was categorized under an existing grant, Pemberian berdasarkan Tahap Pembangunan Ekonomi, Infrastruktur dan Kesejahteraan Hidup (Grant based on Level of Economic Development, Infrastructure and Well-being), which stood at RM350 million at the time.[9] Under the scheme, the Federal Government compensates State Governments for the gazetting of new protected forest and marine areas. From Selangor's implementation of a 25-year logging moratorium[4] to Sabah's zoning of a protected marine area spanning nearly 900,000 hectares[10], state-led initiatives have demonstrated the effectiveness of decentralized action for biodiversity conservation.

2019 Grant based on Level of Economic Development, Infrastructure and Well-being

(Pemberian berdasarkan Tahap Pembangunan Ekonomi, Infrastruktur dan Kesejahteraan Hidup)



[5] *Broadway, Robin & Shah, Anwar (e.d.).* ***"Intergovernmental Fiscal Transfers: Principles and Practice."*** *The World Bank, 2007, https://www.pempal.org/sites/pempal/files/attachments/IntergovernmentalFiscalTransfers.pdf. Accessed 25 January 2023.*

[6] *See Jalil, Abdul & others.* ***"Understanding Malaysian State Governments Fiscal Behaviour: The Role of Intergovernmental Transfers."*** *Munich Personal RePEc Archive, Paper No. 25188, 20 September 2010, https://mpra.ub.uni-muenchen.de/25188/1/MPRA_paper_25188.pdf. Accessed 28 January 2023.*

[7] *Merican, Johan Mahmood.* ***"Ecological Fiscal Transfer in Malaysia."*** *United Nations Development Programme, 9 June 2021, https://www.youtube.com/watch?v=6hI1SYn36SU&t=2645s&ab_channel=undpmalaysia. Accessed 11 January 2023.*

[8] *Busch, Jonah & others.* ***"A global review of ecological transfers."*** *Nature Sustainability, 4, 24 June 2021, https://www.nature.com/articles/s41893-021-00728-0. Accessed 25 January 2023.*

[9] *Zainul, Emir.* ***"MoF: Putrajaya ready to consider requests from state govts to restructure, reschedule loans."*** *The Edge Markets, 22 May 2020, https://www.theedgemarkets.com/article/mof-putrajaya-ready-consider-requests-state-govts-restructure-reschedule-loans. Accessed 25 January 2023*

[10] *See Sabah Parks.* ***"Tun Mustapha Park."*** *Sabah Parks, https://www.sabahparks.org.my/tun-mustapha-park. Accessed 29 January 2023.*

Malaysia is ranked both in the bottom quartile of relative biodiversity conservation funding and the top quartile of threated biodiversity.[2] The budgetary allocations for EFTs have been an important step in this direction, enabling states to perform their biodiversity conservation mandates, but further measures need to be taken to develop EFT practice here.[11] The Ministry of Finance has outlined the need to establish a standardized distribution criterion, structure EFT in a way that incentivizes the behaviour of states, measure the current EFT commitment against potential loss of logging revenues and ensure the utilization of EFT in line with national environmental agenda.[7] An overarching question is on the institutionalization of EFT, from a scheme based on voluntary participation by states toward legislation mandating fiscal transfers according to clearly defined parameters. This change will enable direct administrative accountability and build institutional capacity.

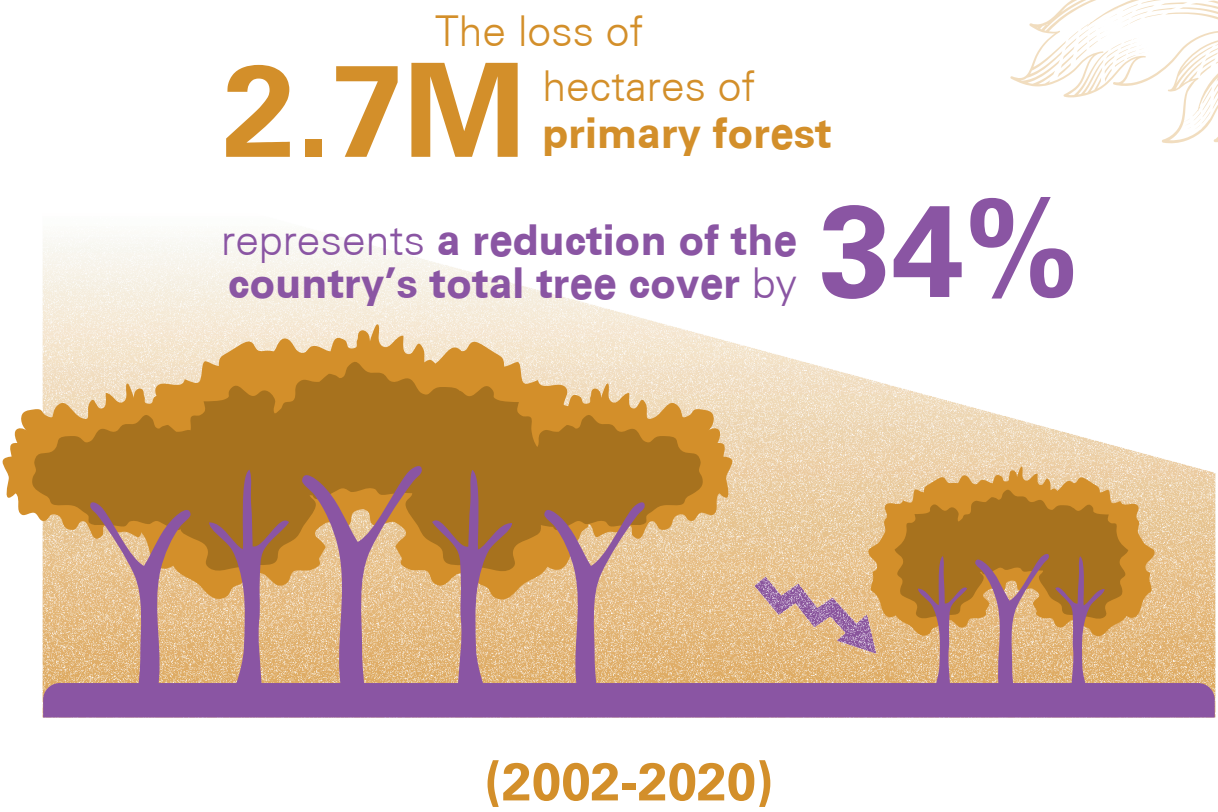
UNDP continues to advocate for and support the work needed to maximize the value EFTs can generate for Malaysia. To this end, the UNDP, in partnership with the Ministry of Finance and the Ministry of Energy and Natural Resources, hosted a webinar in July 2021 to discuss the establishment of the EFT scheme in Malaysia. Over 280 stakeholders across Federal and State Governments, academia, civil society, legal practitioners and private sector contributed to the dialogue. Among the issues discussed, stakeholders emphasized the need for robust institutional infrastructure with proper monitoring and evaluation mechanisms in order for EFT to be effective and sustainable.[11] Looking forward, our collective efforts now lie in maintaining the momentum on EFTs, to formalize the instrument from policy to law for our future.[11]

[11] *Sankar, Preetha & Gan, Pek Chuan.* ***"Ecological Fiscal Transfer – Getting the Incentives Right."*** *United Nations Development Programme, 13 July 2021, https://www.undp.org/malaysia/news/ecological-fiscal-transfer-%E2%80%93-getting-incentives-right. Accessed 11 January 2023.*

Scan the QR Code to watch the UNDP's Webinar on **Ecological Fiscal Transfer in Malaysia**

5.3
Improving Sub-National Legislative Framework for Protected Areas

Our rainforests are home to some of world's highest levels of biodiversity, yet Malaysia was listed as the country with the fourth highest number of threatened animal and plant species in 2019.[1] Forest clearing and land-use change for agricultural activities, housing and public infrastructure resulted in the loss of 2.7 million hectares of primary forest between 2002 and 2020—representing a reduction of the country's total tree cover by 34 percent.[2] This means that these rainforests are less capable of supporting biodiversity, pushing species like the Malayan tiger to the brink of extinction[3], increasing incidents of human-wildlife conflicts and roadkill accidents and exposing humans to zoonotic diseases (that is infectious transmission from animals to human).



[1] *International Union for Conservation of Nature (IUCN). **"The IUCN Red List of Threatened Species."** IUCN, 2019, https://www.iucnredlist.org/resources/summary-statistics. Accessed 19 December 2022.*

[2] *Fazaniza, Elly. **"Deforestation Threat to Malaysian Primary Forests."** The Sun Daily, 12 April 2022, https://www.thesundaily.my/local/deforestation-threat-to-malaysian-primary-forests-JD9063964. Accessed 6 February 2023.*

[3] *World Wildlife Fund (WWF). **"Status of Malaysian Tiger."** WWF, https://www.wwf.org.my/tiger_facts/status_of_malayan_tigers/#:~:text=In%20the%201950s%2C%20Malaysia%20was. Accessed 18 October 2022.*

Biodiversity conservation in Malaysia is a shared responsibility between the federal and state governments. The federal government formulates biological diversity policies, determines national budgetary allocations for states to implement interventions and programmes and promotes public awareness and participation in biodiversity conservation. To ensure that Malaysia's biodiversity goals are met by 2025, the government launched the National Policy on Biological Diversity 2016-2025 (NPBD) which articulated seventeen measurable targets to be achieved in phases over a 10-year period. The NPBD is the guiding mandate for state governments responsible for local policy implementation.

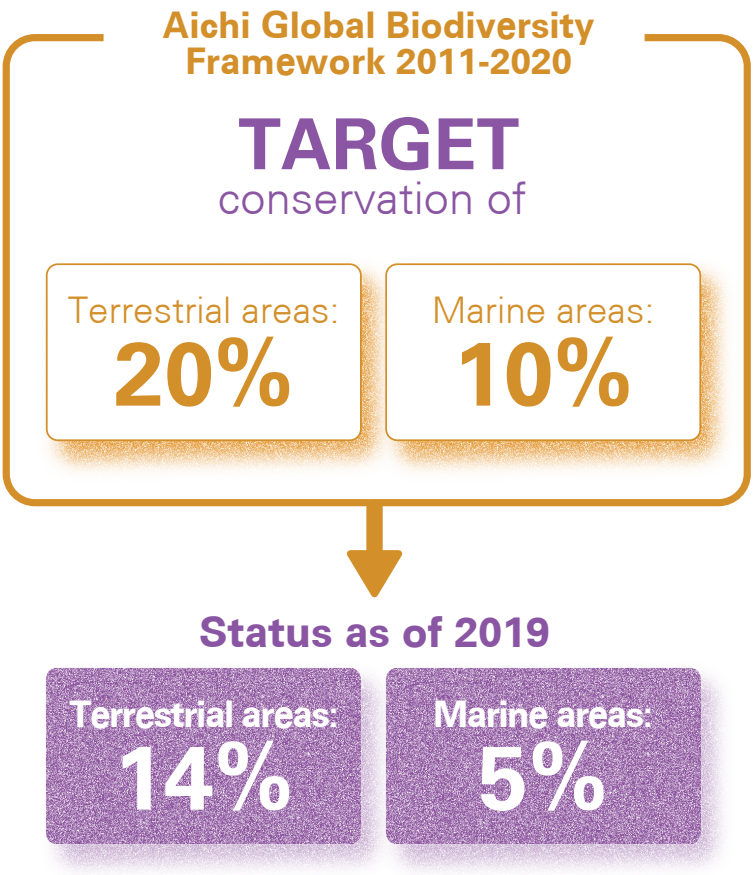
Striking a balance between development and biodiversity conservation is a complex issue for state governments. States generate income from forest revenues by awarding logging concessions and licenses to private firms or state enterprises to harvest forests. Gazetting forest areas thus entails opportunity costs, especially for states that generate significant forestry revenues. For instance, Kelantan, Pahang, Perak, Selangor, Terengganu, Johor and Kedah each generate over RM100 million in forestry revenue annually.[4] To avoid over-harvesting, state governments are required to implement intervals of 25-30 years between each round of logging in permanent reserved forests (PRFs). While allowing for forests to regenerate and recover, the practice limits forestry revenues.

What are Permanent Reserved Forests?

Permanent Reserved Forests (PRFs) are areas that must be preserved as forests unless degazetted. There are two categories of PRFs: production forests where logging and plantation activities can be carried out with restrictions (e.g., intervals between rounds of logging) and protected forests, where these activities are not allowed.

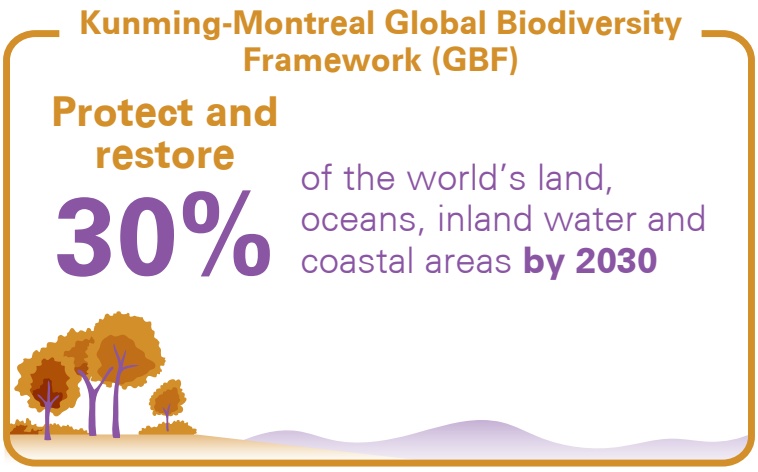
[4] *Law, Yao-Hua.* ***"Revenue and Power Drive Forest Area Changes."*** *Rainforest Journalism Fund, 30 November 2020, https://rainforestjournalismfund.org/stories/revenue-and-power-drive-forest-area-changes. Accessed 16 December 2022.*

To circumvent revenue loss during logging intervals, state governments have converted logged forests to other land uses such as palm oil plantations and other single crop plantations that still qualify the land as forests under Malaysian law. This conversion of PRFs from sustainable logging to monoculture plantations will potentially set back Malaysia's pledge to biodiversity conservation. In 2016, Malaysia committed to conserving 20 percent and 10 percent of terrestrial and marine areas respectively under the Aichi Global Biodiversity Framework 2011-2020. As of 2019, Malaysia was off-track in meeting these goals, with terrestrial and marine protected areas at just 14 percent and 5 percent respectively.[5]



A new pledge was made at the fifteenth Conference of Parties held in December 2022, as nations—including Malaysia—adopted the Kunming-Montreal Global Biodiversity Framework (GBF) to protect and restore 30 percent of the world's land, oceans, inland water and coastal areas by 2030 (30x30 target) while acknowledging the rights of indigenous and local communities that depend on and manage the remaining biodiversity. If we are to meet this pledge, we need stronger national and sub-national legal frameworks and action plans in critical areas such as the protection of intact ecosystems, and on unsustainable production and consumption.

Malaysia, along with 187 other countries, agreed to the new global biodiversity framework



[5] *International Union for Conservation of Nature (IUCN). **"IUCN Green List - Malaysia."** IUCN Green List, https://iucngreenlist.org/country/malaysia/. Accessed 18 October 2022.*

For states to be fully committed to landscape protection and to bearing the associated costs, proper alignment of incentives is necessary. First, the value of forests beyond the value of harvestable products must be properly understood and accounted for. Forest reserves provide critical ecological services (such as water catchment areas, flood mitigation, prevention of soil erosion, biodiversity conservation, carbon sink) as well as economic and socio-cultural services (such as eco-tourism and home for indigenous and rural communities). For example, the Greater Ulu Muda Forest complex in Kedah accounts for 96 percent of Kedah's, 50 percent of Perlis' and 80 percent of Penang's water supplies.[6] Logging activities in this forest complex was the direct cause of the 2016 drought in the northern states, which postponed the paddy planting season.[6] Continuous degazetting and forest clearing for logging and plantations will impact long-term water and food security, with associated economic losses. Second, economic incentives to minimize opportunity costs from land conservation and generate alternative revenue should be diversified. Efforts toward this have been made through the introduction of EFT, ecotourism and the adoption of multiple use forest landscape that enable state governments to conserve biodiversity while sustaining socioeconomic activities within and around protected areas.

Malaysia already has numerous federal laws and state enactments for environmental protection and biodiversity conservation, but implementation and legal enforcement at state level in regard to protected areas remains weak. Subnational legislative frameworks and funding need to be strengthened to ensure that drafted policies and enactments can be effectively carried out by relevant state agencies, thus reducing siloed implementation. A customized framework helps state governments to prioritize and address local conservation issues, and better manage their natural resources. It also encourages participation from affected stakeholders and communities in the decision-making process and exchanges of local knowledge and experience in biodiversity conservation.

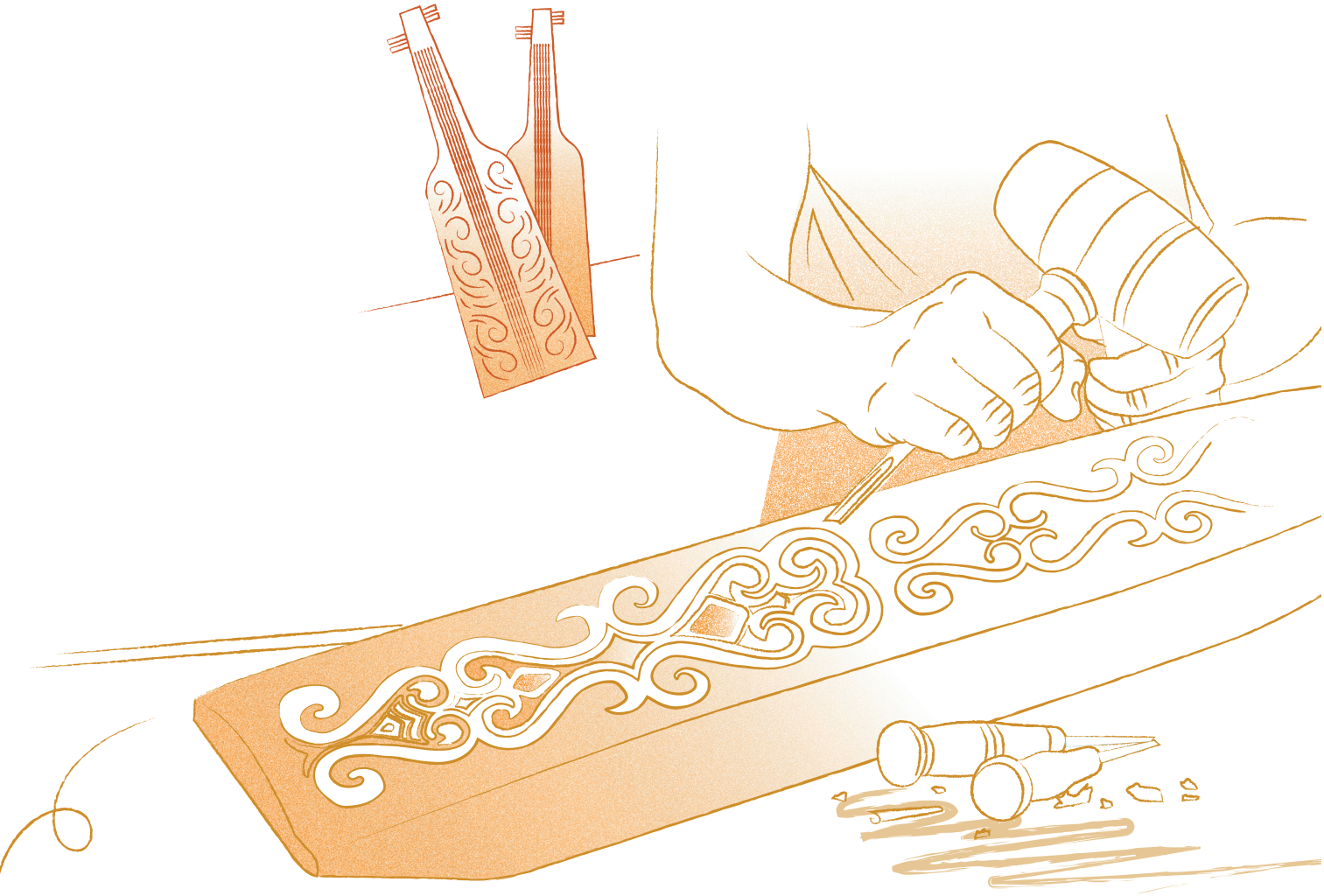
Sabah is an example of successful state-led implementation of systemic interventions for biodiversity conservation. In response to global market demands, Sabah's state government has prioritized deforestation and labour right issues in the palm oil industry. The state has adopted a Living Lab Approach (LLA) which integrates conservation and sustainable development by safeguarding forests, wildlife and rivers, while promoting responsible palm oil production and consumption.[7] In 2015, Sabah's state government also implemented the Jurisdictional Certification of Sustainable Palm Oil, with the aim of achieving full 'Roundtable on Sustainable Palm Oil' certification for all palm oil production by 2025. This 10-year initiative prohibits deforestation, limits development in ecologically sensitive areas and enforces certification standards for chemical use and labour practices across all palm oil plantations, including those owned by smallholders. The green certification standard mandated by the Sabah state government has pushed palm oil producers, consumers and interested parties

[6] *Wong, EE Lyn.* ***"Short-Term Thinking Is Destroying Our Rainforests."*** *The Star, 26 June 2020, https://www.thestar.com.my/opinion/letters/2020/06/26/short-term-thinking-is-destroying-our-rainforests. Accessed 6 February 2023.*

[7] *Bernama.* ***"Bornean Elephants: Balancing Biodiversity Conservation, Sustainable Development in Sabah."*** *Borneo Post Online, 3 January 2023, https://www.theborneopost.com/2023/01/03/bornean-elephant-balancing-biodiversity-conservation-sustainable-development-in-sabah/. Accessed 6 February 2023.*

(such as green groups and NGOs) to monitor and curb deforestation in protected areas. Meanwhile, ecological corridors established in government-supported plantations reduce fragmentation in protected areas and human-wildlife conflicts, enabling animals to roam freely through or around plantations. Additionally, a portion of the LLA funding has been directed towards the employment and empowerment of indigenous community rangers to protect and patrol protected areas and wildlife. These initiatives, combined with the elephant conservation programme, have led to a significant decrease in sapling damage from an average of RM500,000 per year to just RM5,000 in 2018.[7]

As Malaysia works to meet the ambitious targets set out in the GBF, Sabah sets an example of how state-level legislation and actions can help the country achieve the GBF's goal of harmonious co-existence between nature and human beings. If such approaches are replicated elsewhere in Malaysia, the 30x30 target can become a reality.



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5.4
Interview with Febe Soliun, Project Coordinator, Forever Sabah on Mainstreaming of Biodiversity Conservation into River Management project

1. What was the condition of the Segama river site at the time of project and how was it affecting the day-to-day lives of local communities?

Compared to other rivers in Sabah, the Segama river is significantly polluted. We worked with nine villages along the mid-point of the river, typically located by tributaries that feed into the main river. Since the introduction of palm oil plantations in the area, the communities are no longer able to depend on the river for their day-to-day needs and livelihoods. Palm oil plantations and sandmining activity have eroded the riverbanks where communities reside. Many of the community members that bathed in the river said that it smells of oil and they have sometimes developed skin infections and diseases.

Most of the communities along the river don't have access to piped water and the ones that do have to ration their supply, so at 10pm the pipe water supply is turned off. As a result, these communities depend heavily on rainwater. However, during the dry seasons, they need to travel quite a distance just to buy clean water to carry out basic activities such as cooking and washing clothes.

The communities have also been impacted culturally, as they have been unable to source the *ikan patin* (patin fish) needed to make their traditional dish—Tinambak. Because the pollution has affected the riverine population, fishermen must travel further away just to catch a handful of fish at a time, which has ultimately taken a toll on their livelihoods. The livelihoods of women running small food and beverage businesses have also been affected as they can't reliably access clean water for cooking.

2. How did the community become involved in the project? Why did they agree to participate and what perspectives did they bring to the table?

Forever Sabah's approach always prioritizes community engagement via an ethics process known as Free, Prior and Informed Consent. When we approach the communities, we first ask them what issues they are facing and what they want to do within their *kampung* (village). We then integrate their input into our workplan, which is shared with them for their approval before we move forward. It was easy to bring them onboard because we focused on the issues that they were most interested in tackling. They

were motivated by ownership over a project with long-term benefits for them and by them. It is not us telling them "This is what you should do". They know their landscape, their people and their economic activities. All of them have a vision of what they want for themselves, their *kampungs* and their next generation. It was just a matter of us facilitating this process together with them, to support them putting this vision together in the most cohesive manner.

For example, the community already intended to develop a protocol for sandmining because there was a lot of illegal activity being conducted in the area. However, at that time, they didn't know how to go about this, so that was where we stepped in to offer support. There were also existing efforts by community members for riparian restoration and commercial activity. Our role was to support both potential and existing initiatives to maximize their impact.

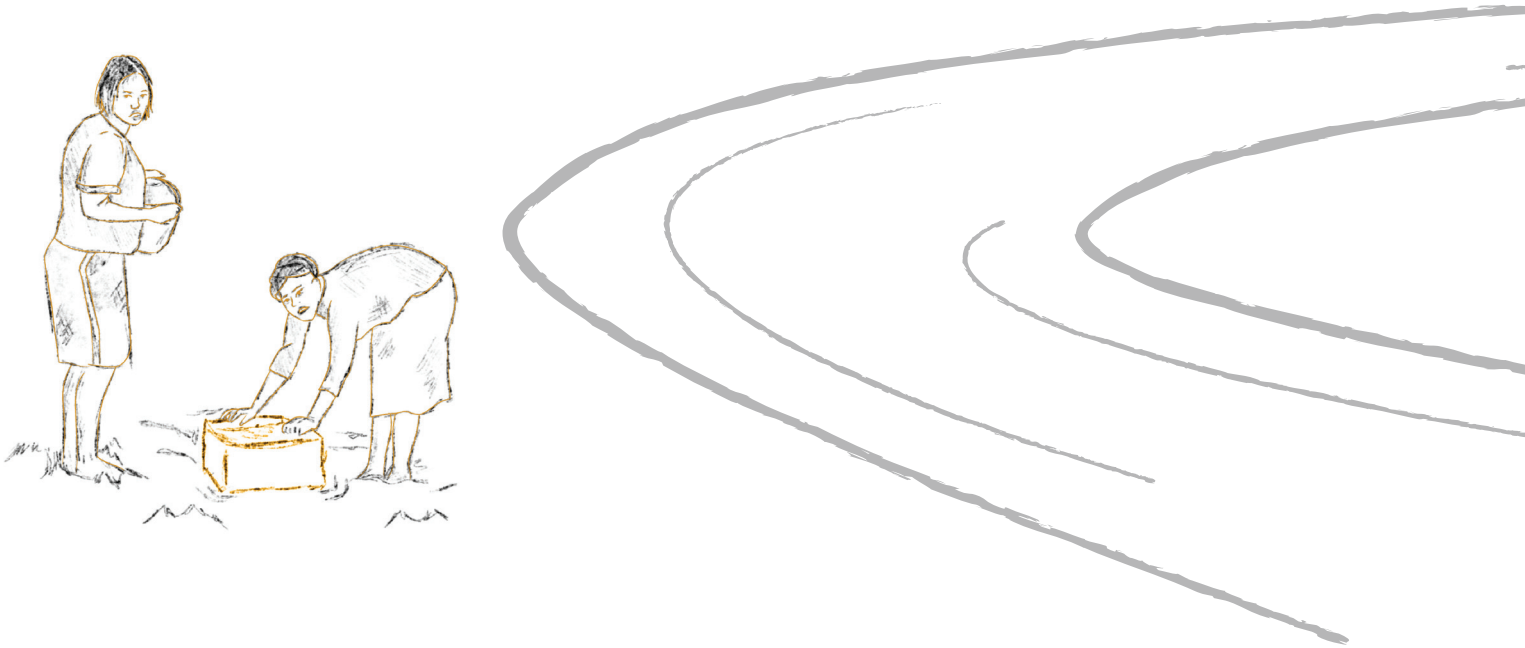
What was really important as well were our local champions and community leaders who helped us with outreach and execution on the ground. *Kak* (Sister) Naw led the *Persatuan Wanita* Ulu Segama (Ulu Segama Women's Association). She rallied women in her area to run an organization that implements livelihood programmes. Uncle Jarandi ran the tree planting programme in our partnering communities, together with other strong community leaders such as Uncle Siukong and Michael Samirai. He had previously worked with a palm oil company, so he had a lot of knowledge on restoration.

3. How did the project link natural resource conservation with community livelihoods?

Firstly, within the communities, almost 90 percent of the villages had their own palm oil plantations, so we focused on ensuring certification of palm oil smallholders. Getting them certified increases their market and premium, improving their income. At the same time, they will be required to follow certain standards to safeguard the health of the river.

Secondly, we connected with Nestle, who were looking to plant trees for their own forest restoration projects and were encouraging local communities to set up their own nurseries. We set up ten nurseries across partnering communities through the pilot. Alongside selling the trees to Nestle, the native riparian species planted were also used for Segama's own restoration projects along its riverbanks. So instead of just buying seedlings, communities can now grow and plant their own trees. The Sabah Forestry Department in Lahad Datu has also engaged these nurseries to purchase trees for their own forest restoration projects.

Thirdly, to boost entrepreneurship capacity among women, we ran workshops and provided seed funds that were used to start up new or support existing businesses. They would then pay the money back into the Persatuan for other members' benefit. Looking forward, we acknowledge that engaging with women in these communities also entails engaging their



children, as their main commitment is their family. Recognizing this, we aim to hold activities for children so that the women can attend workshops or spend time on business activities.

4. This kind of work requires both technical expertise and the ability to build relationships with local communities. What does this look like?

We use an approach based on citizen science, which presents opportunities for knowledge-sharing between technical experts and local communities. For example, we did a water quality assessment with a technical expert and community members where insights were exchanged on water collection methods and testing variables. We also implemented this approach with the tree planting initiative. This is also an important process as we acknowledge that communities are able to build technical skills when provided with the right opportunities. At the same time, we are able to learn more about and document indigenous knowledge. For this, it is important for us to be on the ground. It is not just making observational visits but to be involved in the things that we ask the communities to do.

Do you go with the *flow* ?

River management is crucial to restore cleanliness and biodiversity. Our knowledge alone would not suffice to better our rivers, but gathering community knowledge and engagement help to strengthen our conservation effort.

Scan the QR Code to find out more about **river management.**

5.5
Crowd-Sourced, Citizen Science

What does a scientist look like? We might think of serious professionals in immaculate white laboratory coats or absent-minded but brilliant persons with unkempt hair. Usually, we imagine that they are different from 'us', the ordinary population. After all, the scientific method is a rigorous, carefully controlled process of observation and testing to generate objective and reliable knowledge—and this is not something that just anyone can do. It requires years of specialization, study and training to become a competent scientist. Conversely, untrained people who think they know better than scientists can generate harmful misinformation. Does this mean that science should belong to professional scientists? What if there are important and unique contributions you and I as ordinary citizens can make to the scientific process?

Citizen science is simply science carried out by ordinary citizens, often in partnership with professional scientists or as networks of volunteers. Citizen science does not replace the work of professional scientists. Rather, citizen scientists bring their unique value propositions—the amount of manpower that can be mobilized, local knowledge, the ability to disseminate findings to particular stakeholders and more. Here, we describe a few examples of citizen science in Malaysia that we have come across and the value these have generated.

Value Proposition of Citizen Scientists

Manpower

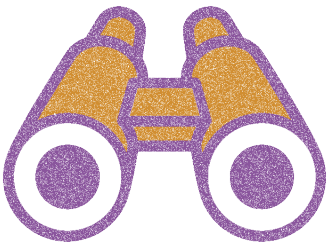
Local knowledge

The ability to disseminate findings

In 2021, the UNDP partnered with Sekitar Kita for the Urban Biodiversity Challenge[1], mobilizing 756 citizen scientists to make 21,408 observations within one month, documenting 2,567 different species of flora and fauna in Malaysian urban environments. Participation was simple: download the iNaturalist application on a smartphone then take and upload pictures. The application used image recognition software to help ordinary users identify the plants and animals they had photographed; when that did not work, other users—biology enthusiasts or trained scientists—stepped in to help.

Urban Biodiversity Challenge in 2021

756
citizen scientists joined



21,408
observations

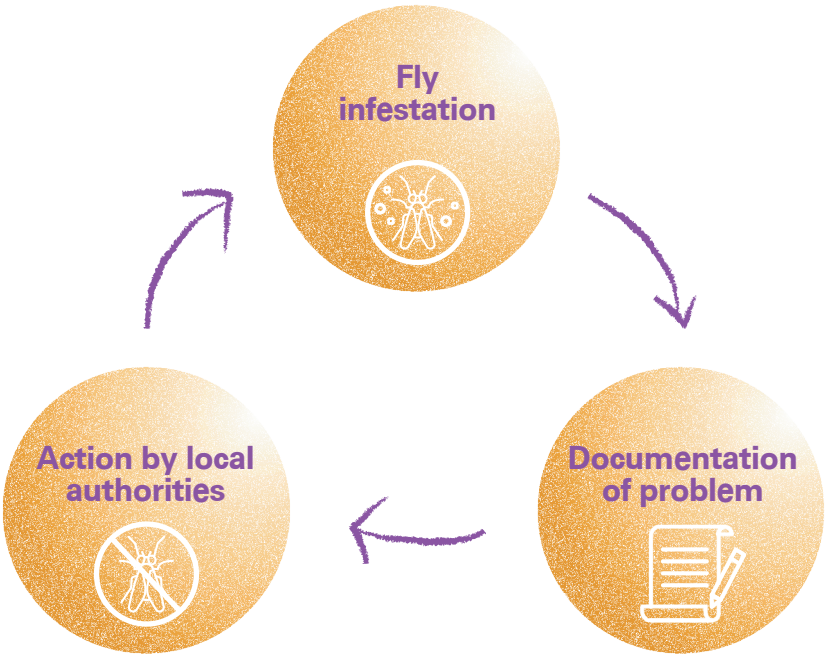
documentation of
2,567
different species of flora and fauna

[1] *Sekitar.* ***"Urban Biodiversity Challenge."*** *Sekitar, https://sekitar.com.my/projects/di-sekitar-kita/ubc/. Accessed 5 Feb 2023.*

The data collected during the Urban Biodiversity Challenge was not representative of the actual ecology of Malaysian urban environments. Species representation was skewed by ease of photography (slow-moving snails were one of the most-observed species, whereas there were few pictures of birds), species attractiveness to participants (flowering plants were highly represented), and the time-of-day species are active (there were relatively few observations of nocturnal animals). However, these observations reflect how Malaysians perceive and interact with nature in towns and cities and show the differences between what novice observers and expert observers see. Nonetheless, the sheer number of participants and observations meant that some uncommon species were captured by non-experts, observations that a professional scientist would not easily obtain themselves. These findings—of urban ecology and how we observe and experience it—is useful for engaging the public on the space for nature in the city.

We came across a second example of citizen science while visiting Manjung, Perak to explore opportunities and partnerships for ecotourism. Poultry farming is an important agricultural industry in Manjung. However, the waste produced can become a breeding ground for flies if not properly managed. The local council has worked with producers on waste management procedures to address this problem; nonetheless, fly infestations still occur periodically.[2] When this happens, the local community distributes fly paper and documents the number of flies caught until the problem is resolved. This not only generates clear evidence to spur corrective action, but also enables the community to track and provide feedback on the effectiveness of these actions. This is an example of how simple tools combined with community organization can empower local communities to gather data and advocate on local issues.

How Citizen Science Enabled Local Action



[2] *Aqilah, Ili.* ***"Fly infestation taking a toll on Manjung folk."*** *The Star, 14 September 2021, https://www.thestar.com.my/metro/metro-news/2021/09/14/fly-infestation-taking-a-toll-on-manjung-folk?fbclid=IwAR2ycqOuY06YHLUfD2NouPjsspKpSdY17GBYDdvEEedrpbE2IS7qk1_TWDo. Accessed 26 August 2022.*

A third example of citizen science comes from the many river conservation groups in Malaysia that care for and monitor the ecological health of river sites, including some that the UNDP has worked with and supported in various ways. Along the Kinabatangan River, indigenous groups use deep local knowledge of the land and rivers to identify key water quality sampling sites that enable tracking of pollution sources causing mass fish kills.[3] University scientists have developed tools for community-based water quality monitoring that help citizen scientists in the Langat River Basin understand and communicate their findings.[4] Neighbourhood river conservation groups along the Klang River combine river monitoring and conservation activities with placemaking to help residents develop an understanding of and interest in the health of the river.[5]

In these and other examples of citizen science in river conservation, we see how citizen scientists working over extended periods change how we understand and relate with the natural environment. While professional scientists could collect the same data, the fact that the data is generated by people with a direct stake in these places makes a difference in communicating the findings. Hearing about the condition of the river from a neighbour or a constituent who has lived there for years is different than hearing about it from an outsider. The former is much more likely to generate interest and action. In addition, as local communities develop the capacity to study and understand the natural environment in their neighbourhoods, they also develop an appreciation of its value and the motivation and ability to protect it.

Neither science nor environmental well-being should be left entirely to professionals. There is so much that ordinary citizens can do with a little training and support. We can expose people to opportunities for citizen science, beginning in schools and universities. We can create partnerships with researchers or authorities where citizen science can contribute toward knowledge or environmental monitoring. We can connect citizen science groups with experts and build citizen science networks to develop grassroots capacity. If we do these things and create an ecosystem that supports the contributions of ordinary people, we will unlock a key bottom-up driver for environmental protection and sustainable development.

[3] *Wilson, Ken.* ***"How citizen science is transforming river management in Malaysian Borneo (commentary)."*** *Mongabay, 29 November 2016, https://news.mongabay.com/2016/11/how-citizen-science-is-transforming-river-management-in-borneo/. Accessed 26 August 2022.*

[4] *Nabila, Nurul & Shamsi, Nurulaini Abu.* ***"Eco-Heart Index: The science of loving our rivers."*** *Science Media Centre Malaysia, 26 February 2022, https://sciencemediacentremalaysia.com/opinion/2022/02/opinion-eco-heart-index-the-science-of-loving-our-rivers/. Accessed 26 August 2022.*

[5] *Michael, Kennedy & others.* ***"World Water Day: Solving People's Problems through Rivers."*** *Youth Environment Living Labs, 18 March 2022, https://yell.my/world-water-day-solving-peoples-problems-through-rivers/. Accessed 26 August 2022.*

Living harmonionusly with nature is attainable with the **UN's 2050 Vision.** To find out more about the values needed and possibilities out there for biodiversity conservation, scan the QR Code.

5.6
The Urban Biodiversity Challenge

Scene 1: Community Members

Leaves rained down onto the tarred road. "Look up!" Wei Chuen bellowed, pointing towards a flurry of movement in the trees overhead. Suresh's gaze followed Wei Chuen's outstretched arm, revealing a troupe of monkeys chasing each other amongst the webbed canopies above.

Just half an hour earlier, Suresh and Wei Chuen set out from their homes, equipped with their newly downloaded iNaturalist apps to take on the Urban Biodiversity Challenge.

Suresh and Wei Chuen have been neighbours for as long as they could remember, with both their families' histories in the neighbourhood stretching back three generations. Yet, the monkeys were the *Taman's* longest-running residents, long before swathes of jungle were cleared for bamboo- and (eventually) brick-walled homes. These days, they are seen as pesky intruders that infiltrate unsuspecting homes to ransack their pantries. Just yesterday, Suresh's neighbour had complained that his favourite *pulut tekan* had been snatched up from his kitchen countertop by the neighbourhood culprits.

One... two... three... four... five... six—there must be at least ten of them up there… Suresh thought as he and Wei Chuen angled their phones to get a clear shot. As he wondered what kind of monkeys they were, he realized that the only thing he had been told about them was to stay away, out of fear of provoking a papa or mama with their infant. This was a common caution by joggers who Suresh had met on his usual circuit around the park.

"Did you see the purple flowers blooming in the *longkang* behind Uncle Terrence's house? I hadn't noticed them before—especially when the *longkang* was carrying all that rainfall from the last couple of months," Wei Chuen chortled in between mouthfuls of *roti canai*. The two now sat at the local *mamak*, exchanging their findings. Just as Suresh was about to respond, he spotted a new activity update come in on the iNaturalist app. A user had verified the app's identification of the monkeys he spotted earlier.

Scene 2: Biologist

Thumbing through the latest observations logged on the iNaturalist app, Suraya instantly recognized the pig-tailed macaque, or the *Macaca nemestrina*. Its stumped chestnut tail made it easy to differentiate from its counterpart, the long-tailed macaque, or the *Macaca fascicularis*.

The two species are fellow urban dwellers in residential pockets around the city, teetering along razored jungle edges, fragmented forested areas or the odd tourist site. She checked the most recent observations in the tagged neighbourhood and noticed a stream of submissions featuring macaques. These primates descend from high ground towards human-occupied areas during the dry season when there is a decline in fruit availability. *So, the increased observations of macaques made sense at this time of year,* Suraya mused.

Suraya has been working on a research project studying the relationship between macaques and humans in urban environments. This is commonly met with surprise by her friends and family who ask, "Monkeys? Are you sure-*ah*? Still got *meh*?" As her peers join the droves

Glossary
-ah: A colloquial expression in Malaysian English that is typically used at the end of a sentence to modify its tone. In the context of a question, -ah is to relay doubt or disbelief.
Longkang: Drain
Mamak: Open-air eateries serving Indian-Muslim cuisine
Meh: A colloquial expression in Malaysian English that is typically used at the end of a sentence to modify its tone. In the context of a question, meh is to relay doubt or disbelief.

of young urbanites moving into newly-erected high-rise apartments, they become bewildered at the thought of monkeys roaming the fringes of the cityscape.

Suraya learnt of the iNaturalist app from a fellow colleague participating in the Urban Biodiversity Challenge. She noted that the neighbourhood where this pig-tailed macaque was observed has experienced several construction projects of late, from high-density apartment complexes to mega-highways. She glanced up from her phone towards the skyscrapers choking her view. How would the rapid urbanization in this neighbourhood continue to impact the coexistence of macaques and humans? Gazing out of her office window, Suraya decided to visit that neighbourhood over the coming weekend.

Scene 3: Data Analyst

Jareen watched her laptop screen flicker to black as she logged off from a day of work. Along with her team, she had just concluded the results analysis of a survey with participants from the Urban Biodiversity Challenge. "Jareen! Come help *apai* water the plants," Jareen's father called out from outside. She retreated from her desk to step out into her backyard. Jareen lived with her parents in a corner lot that allowed her father's garden to snake around their one-storey home.

The majority of survey respondents indicated that they spend time with nature closest to their homes. Most of their observations were made from roadside drains during a neighbourhood walkabout or in public parks as part of their exercise routines. Community farms and forest reserves were the places least familiar to respondents.

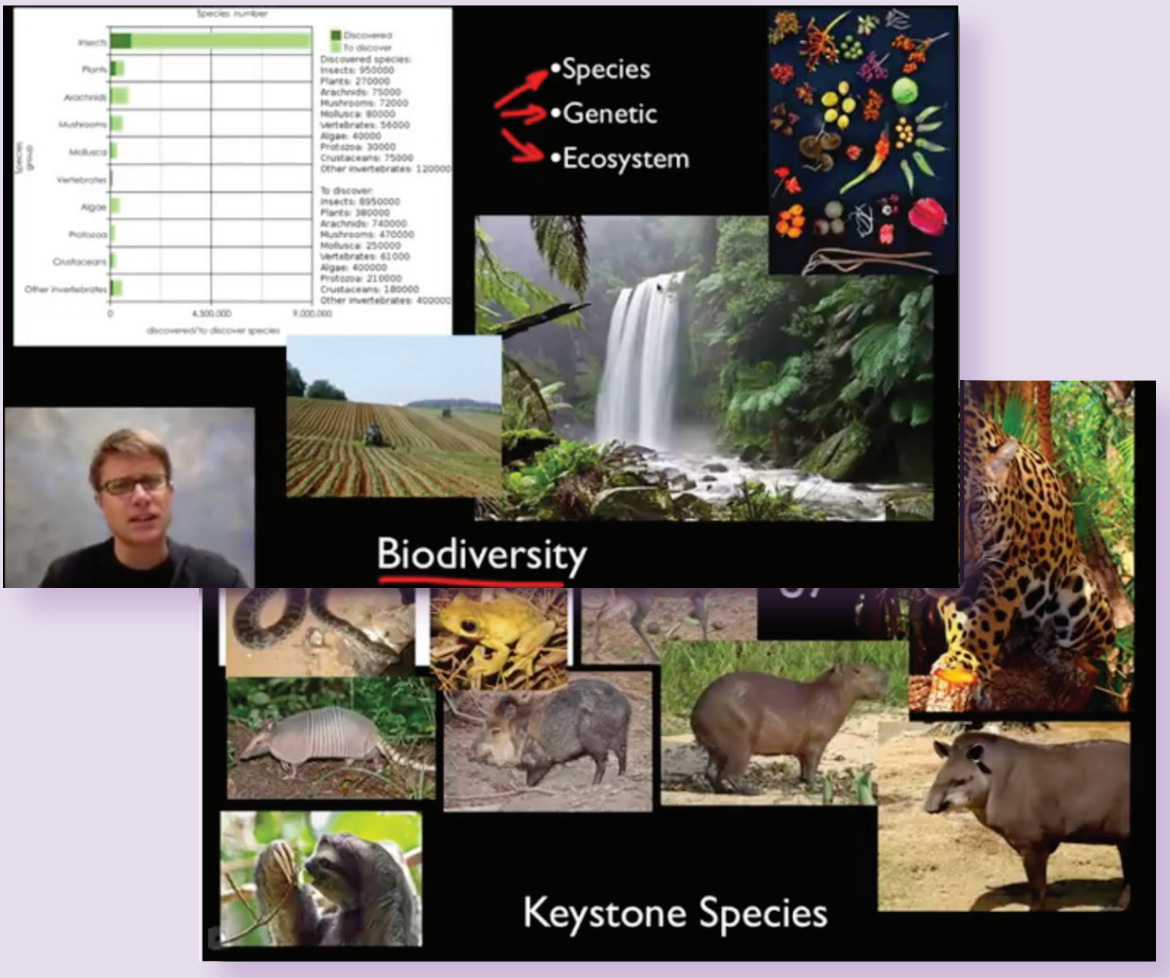
She glanced around her, taking in the neatly pruned shrubs peppered with the blooming bougainvillea her mother is so fond of. Survey respondents preferred 'controlled' nature: urban parks and home gardens that feature singing birds or bright flowers. Meanwhile, 'invasive' animals and plants like monkeys and weeds were regarded unfavourably.

Watching her father tend to his garden, Jareen dwelled on this binary perception of 'good nature' and 'bad nature'. As concrete gnaws through the city's valleys, how could nature and human habitats coalesce and coexist? Citizen science activities like the Urban Biodiversity Challenge could be a part of empowering curiosity and appreciation amongst urban dwellers, she hoped. From the 100-year-old raintrees lining the city centre to the touch-me-nots sprouting between the pavement cracks, there are big and small wonders all around our urban surroundings, just waiting to be noticed.

Glossary

Pulut tekan: A glutinous rice dessert that is blue and white in colour, usually paired with coconut jam
Roti canai: A type of flatbread typically served at mamaks
Taman: A residential area

The Urban Biodiversity Challenge (UBC), conducted in partnership with Sekitar Kita, invited Malaysian urban dwellers to document plant and animal life in their homes, neighbourhoods and cities via the iNaturalist app. Kicked off in conjunction with the annual, global City Nature Challenge (30 April to 9 May 2021), the citizen science programme encouraged citizens to identify and map the plant and animal biodiversity in their cities as well as deepen their understanding of community norms, values and attitudes towards urban biodiversity. A research analysis produced by Sekitar Kita unpacked how survey participants observed and perceived urban biodiversity through the UBC. Over the challenge period, a total of 21,409 observations were made by 756 observers, featuring as many as 2,567 species.



Scan the QR Code to dive deeper into **Biodiversity** with renowned education consultant, Paul Andersen.