



# PENANG GREEN AGENDA 2030

Title: Biodiversity and  
Natural Ecosystems

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## EXECUTIVE SUMMARY

In 2016, the Malaysian Government launched the updated National Policy on Biological Diversity (NPBD) as a tool to protect and enhance the biodiversity of Malaysia. It sets out several important principles and focus areas that aim at increasing public awareness and improving decision-making in relation to biodiversity protection. All States, including Penang, are required to implement the NPBD.

Despite its size, Penang is rich in biodiversity – it still has around 7,700 ha of forested area, 5,000 of which are permanent forest reserves (hutan simpan kekal or HSK), and is surrounded by a rich and productive sea.<sup>1</sup> Most of the HSK are under State jurisdiction and are protected as water catchment areas, while around a fifth is protected as National Park managed by the Federal Agency of PERHILITAN. There is no productive forest (for timber production) in Penang and forests are currently used for recreational purposes. Nearly all HSK in Penang are open to public access, free of charge. Penang's marine resources are generally under the jurisdiction of the Department of Fishery, which is tasked to develop an efficient and effective fishery sector for Penang. Its focus is therefore on fishery production rather than conservation although long-term sustainability of fishery is also one of its objectives. The Department of Fisheries focuses on the inland aquatic environment and is also concentrated on productive fisheries rather than the overall health of the ecosystem.

Penang is rich in various mammal, insect and bird species. Its iconic medium-sized mammals include monkeys, squirrels and tree shrews. Penang is also host to various resident and migratory bird species, which can be found in places such as Teluk Air Tawar, Pulau Burung and Permatang Pauh. The marshlands and mangroves of Penang are particularly important as bird habitats. Species conservation effort is currently led by both PERHILITAN as well as private entities like NGOs and eco-tourism businesses.

The largest oversight in biodiversity protection in Penang is the incomplete data and the lack of a centralised database. Although different agencies and research institutions do collect specific data for their own use, these data are limited in scope and are not compiled into a centralised system. Partly because of this and partly because of lack of knowledge, decision-makers do not usually look at the impact of a particular project or policy on biodiversity in Penang. This as well as the lack of effective laws and enforcement powers result in habitat destruction and fragmentation in Penang, which in turn causes overall biodiversity depreciation. In addition, continuous urban development and expansion also means that human interests have always trumped those of the animals or natural ecosystems.

There is also a lack of understanding and appreciation of Penang's biodiversity among the public. Although celebration of Penang's cultural heritage has intensified since the recognition of George Town as UNESCO World's Heritage Site, there is yet to be any significant acknowledgement of Penang's natural heritage. Furthermore, given its mostly urban setting, Penang has also not given too much attention or importance to urban biodiversity. This indifference partly stems from the perceived lack of value, especially monetary and cultural value, of Penang's natural ecosystems and biodiversity. Lastly, there

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<sup>1</sup> KATS, Forestry Statistics Peninsular Malaysia 2018.

are severe gaps in the understanding and management of Penang's marine and river ecosystems. A lack of comprehensive information about these ecosystems and the lives they support means there is no understanding of how these ecosystems are faring and how resilient they are against future threats. The lack of planning and effective management is also the result of the absence of strong governance regimes for these resources.

The BIOD Working Group proposes the following five recommendations to implement and achieve the objectives of the NPBD in Penang:

### **1. Urban Biodiversity (2020)**

Penang is one of the most urbanised states in Malaysia where built-up area is expected to reach about 50% of its landmass. Although Penang's forest reserves are protected, they only account for 5% of its land area. This means that biodiversity protection is not only important in forests but also in the urban setting. To help enhance and protect its urban biodiversity, the State Government should adopt an **Urban Biodiversity Policy** or Plan to lay out how to use urban spaces to enrich local biodiversity. The Policy can provide guidelines, which can be incorporated into the relevant plans, on how urban planting can be carried out to maximise the potential for biodiversity. This is particularly true for landscaping activities on state and council land. Local Governments invest a lot of money in public landscape every year but the design of landscape is very much driven by cost-saving considerations, i.e. which species or types of planting can minimise maintenance cost. This results in single-species and linear planting. The lack of an urban biodiversity focus or policy also means trees and plants have too easily been sacrificed for houses or roads. Instead, an Urban Biodiversity Policy can facilitate the adoption of **nature-based solutions in addressing urban challenges** such as the use of **blue-green infrastructure for stormwater management**, the creation of **Green Connectors** (which also targets using green engineering to reduce urban heat island effect) as well as urban farming. Rewilding of the urban landscape, for example, can promote urban biodiversity and provide urban corridors for wildlife while also reducing maintenance costs. Having an urban development plan that is sympathetic to the survival of urban wildlife is consistent with making Penang a liveable place for all types of creatures, not just people.

### **2. Promote Penang's Eco-Tourism and Natural Heritage (2021)**

Penang State and Local Governments need to recognise the economic value of Penang's rich ecosystems and biodiversity, which can be promoted through eco-tourism and cultural celebration. Penang has set precedents of world-class standard eco-tourism operations such as The Habitat, Tropical Spice Garden, Entopia etc, which are the blueprints for future development of ecotourism (including cottage industries) in Penang. The Government should also invest in capacity building and work with state and federal agencies that own the various parks to promote preservation and conservation of Penang's natural heritage (e.g. through the creation of nature trails, education programmes and so on). In particular, **eco-tourism needs to be prioritised** over other types of development in areas with important ecosystems (or biodiversity hotspots), such as hill forests, mangrove forests, and pristine coastal areas and rivers. Penang's eco-tourism industry can also be boosted through the **celebration of Penang's natural heritage** either via existing festivals such as George

Town Festival and Penang Hill Festival or new festivals to coincide with World Biodiversity or Ranger Day. Bio-cultural elements of Penang's biodiversity, such as specific cultural activities involving local species or the role of biodiversity in Penang's cuisine should be highlighted. In relation to the latter, the importance of biodiversity in Penang's culinary richness can be emphasised in Penang's celebration of foods (such as through Penang International Food Festival). To complement Penang's eco-tourism and heritage celebration, the Government should also work with various partners (including NGOs, research institutes and private businesses) to further strengthen **environmental education and awareness** around Penang's natural ecosystems, flora and fauna. Specific species of flora and fauna (such as the vampire crab that is endemic to Penang Hill) can be highlighted as ambassadors for public engagement and education.

### 3. Penang Biodiversity Centre (2021)

Penang should establish a **Biodiversity Centre or Unit** that not only oversees biodiversity protection in Penang but also acts as one of the 5 national biodiversity centres to be set up under the National Policy on Biological Diversity (NPBD). The Centre will oversee biodiversity of all types of ecosystems including forests, maritime, rivers, caves, and urban biodiversity. The mandate to set up the Centre should be established by a **State Policy on Biodiversity**, and it can be a quasi-Government entity, co-run by Non-Government experts (such as scientists and universities). The Centre should have the mandate to collect and collate all **biodiversity-related data**. Furthermore, given the relatively scarce information on Penang's marine ecosystem, the Centre should prioritise working with the Department of Fishery in gathering data especially a **state-level fish stock inventory** to keep track of this important food source for Penang. This can be done through public-private collaboration on a "Bio Blitz" equivalent exercise for the marine environment. The Centre should also come up with short- and long-term plans on biodiversity protection in Penang. Once biodiversity data is collected, which can include a species directory, the Centre should designate **biodiversity "hot spots"** or protected areas in Penang. Biodiversity "hotspots" can be species (e.g. bird areas) or ecosystems (e.g. coral reefs) specific. They can also include important migratory corridors for unique species. Based on these hotspots, the State Government can establish the first Marine Conservation Areas in Penang. These "hot spots" must be clearly identified in Land Use Plans and should be given adequate protection such as through legal gazettment. Another task of the Centre is to promote research collaboration on its natural ecosystems and biodiversity, which requires clear guidelines on material access and data sharing. It should also undertake studies to establish the intangible value of biodiversity. More importantly, the Biodiversity Centre should be consulted on the planning and decisions on land development that are most likely to have a significant impact on biodiversity in Penang.

### 4. Financing for Biodiversity Protection (2022)

In line with the national biodiversity policy, the Penang Government needs to secure sufficient funding to protect biodiversity in Penang. The State Government can utilise the **national initiative on BioFin (biodiversity financing)** to build capacity in assessing financing needs and exploring viable financing avenues for future biodiversity protection. For example, the State Government should aim to set up the **Payment for Ecosystem Services**

**(PES) scheme.** This scheme should target ecosystems and biodiversity that are unique or important to Penang and the region, and entities that derive direct benefits from them such as water consumers, park users and even farmers. In addition, the State Government can also set up a **Trust Fund for Biodiversity Protection** with a clear mandate to receive and disburse funding for biodiversity protection purposes. Funding can come from public and private sources. The PES scheme and Trust fund can be managed by a Biodiversity Centre or Unit dedicated to protecting and enhancing biodiversity in Penang and the region. Once the Trust Fund is set up, it can become a vehicle for receiving international funds such as through dedicated funds (e.g. Adaptation Fund) or carbon offset schemes. Use of revenues from the PES scheme or Trust Fund should be limited to biodiversity protection activities and nothing else. Apart from understanding the cost of biodiversity protection, the State Government also needs to understand the cost of inaction, i.e. future losses resulting from the failure to protect Penang's biodiversity etc. This will further clarify the choices and trade-offs policy-makers have with regards to Penang's natural environment at any specific time.

## **5. Integrated River Authority and Integrated River Basin Management (2023)**

There is currently no one agency that is responsible for looking after river ecosystems in Penang – the Department of Drainage and Irrigation (JPS) is in charge of drainage and irrigation; Department of Environment (JAS) is in charge of water quality; while the Department of Fishery is in charge of inland fisheries. Penang also does not have an integrated river management regime, which means no-one takes the responsibility for rehabilitating rivers and ensuring that rivers are used sustainably. As a result, almost all of the big rivers are severely polluted. Rehabilitating rivers not only helps revive aquatic ecosystems, it can also increase water security as Penang rivers are an alternative source of water supply. There should be a **body or authority with a clear mandate to manage Penang's rivers in an integrated fashion**. This body must be able to take action against sources of river pollution such as illegal dumping and discharging from domestic users. The custodian of Penang's rivers could be either the Mayors of MBPP and MBSP, or an upgraded Bahagian Kawal Selia Air, which is put in charge of looking after Penang's water catchment areas. The JPS could also be a good candidate as they are already receiving funding for river management, although there are concerns about their lack of capacity in adopting a "softer" approach (as opposed to concrete-based engineering solutions) to whole-ecosystem river management. The river authority / custodian can work closely with the Biodiversity Centre or Unit to carry out river rehabilitation and protect river ecosystems. Penang also needs to accelerate the adoption of the Integrated River Basin Management approach to make sure that all uses of the rivers and the surrounding land are governed in an integrated manner.

# 1. Background

## 1.1 Penang Green Agenda 2030 and Biodiversity and Natural Ecosystems

Biodiversity and Natural Ecosystems is one of the ten key focus areas that are important for Penang to achieve its sustainable development goals by 2030. Penang is one of the most urbanised states in Malaysia with over 90% of its people residing in urban areas.<sup>2</sup> Penang is also the centre of Malaysia's Northern Conurbation and we will continue to see the cities and towns of Penang grow as an economic powerhouse for the Northern Region. The existing development paradigm leans toward urban sprawl/lower density growth that continues to expand into undeveloped land. According to the State Structure Plan 2030, around 46% (50,000 ha) of the whole of Penang State has been set aside as a build-up area.<sup>3</sup>

On the other hand, Penang has rich ecosystems and its national park (one of the world's smallest national parks) is conveniently only 30 minutes away from George Town. Penang Hill is host to a 130 million year-old forest, and mangrove forests still dot the shoreline of Penang Island as well as the mainland.<sup>4</sup> Penang does not have any designated marine park although its national park does extend out to the surrounding sea. It also has seagrass beds in the eastern coast of Penang Island such as Pulau Gazumbo and Pantai Jerejak and coral reefs around Pulau Kendi, which provide the habitat, feeding and breeding ground for various marine organisms and local fishing communities. Penang potentially also has a rich urban biodiversity although so far no data has been collected. These ecosystems are host to a great variety of flora and fauna, some of which are unique to Penang.

The tussle between development and the need to protect Penang's natural ecosystems will continue to worsen, with the latter expected to lose out due to rapid development. Although Penang has promised to preserve its existing forest reserves, gaps and challenges remain including the lack of biodiversity-specific protection policy as well as marine protected areas. Also, Penang still lacks a policy framework to protect its urban biodiversity apart from the minimal requirement for green space in development projects. However, the recent Green Connectors initiative may yet give Penang's urban biodiversity a new impetus.

In 2015, the Federal Government adopted a comprehensive National Policy on Biological Diversity (NPBD) (2016-2025). NPBD provides a useful framework for targets, actions and policy implementation on biodiversity protection in Malaysia. It also sets out a governance structure that includes National and State Level Steering Committees for the NPBD, and the civil society / private sector-led National Biodiversity Roundtable (NBR).

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<sup>2</sup> Department of Statistics Malaysia

<sup>3</sup> Rancangan Struktur Negeri Pulau Pinang 2030.

<[http://epublisiti.townplan.gov.my/turun/rsn\\_pulaupinang2030/rsnpp2030.pdf](http://epublisiti.townplan.gov.my/turun/rsn_pulaupinang2030/rsnpp2030.pdf)>

<sup>4</sup> "International researchers to study Penang Hill's 130 million-year-old rainforest". *Malay Mail*, 16<sup>th</sup> October. <<https://www.malaymail.com/news/malaysia/2016/10/16/international-researchers-to-study-penang-hills-130-million-year-old-rainfo/1228665>>

Among its 17 specific targets is the commitment to conserve 20% of its terrestrial areas and 10% of its coastal and marine areas.<sup>5</sup>

The Working Group on Biodiversity and Natural Ecosystem (BIOD) examines the extent to which the NPBD is being implemented in Penang. In particular, it aims to identify the priority areas / issues for Penang as well as the measures already in place or yet to be adopted in order to achieve the 17 targets under the NPBD. It explores the use of innovative mechanisms (technology, governance and financing) to turn Penang into a torchbearer of the NPBD in Malaysia.

## **1.2 Current Situation**

### **1.2.1 National Policy on Biological Diversity (2016-2025)**

Malaysia is blessed with a rich biological diversity: there are an estimated 15,000 species of vascular plants in Malaysia (with about 8,300 species in Peninsular Malaysia and about 12,000 in Sabah and Sarawak), 307 known species of mammals (30 of which are endemic to Malaysia), 785 species of birds, 242 species of amphibians and 567 species of reptiles, as well as 2,068 species of freshwater and marine fishes.<sup>6</sup> The first National Policy on Biological Diversity (NPBD) in Malaysia was actually formulated in 1998. However, due to rapid development and population increase, biodiversity in the country continued to be threatened by habitat fragmentation, invasive species, pollution, poaching, land use pressure as well as climate change. Nearly half of the nation's plant diversity is facing various levels of threat.

In 2016, the Federal Government decided to revise the NPBD to deal with the present and future challenges, and as a response to the Convention on Biological Diversity's Strategic Plan for Biodiversity 2011-2020. It is guided by five principles: Heritage (biodiversity as national heritage), Precautionary (lack of full scientific certainty not an excuse to not take actions), Shared Responsibility (by all sectors of society), Participatory, and Good Governance (accountability and transparency). The new NPBD contains 5 goals, 17 targets and 57 actions.

The five goals of the NPBD (2016-2025) are:

Goal 1: We have empowered and harnessed the commitment of all stakeholders to conserve biodiversity

Goal 2: We have significantly reduced the direct and indirect pressures on biodiversity

Goal 3: We have safeguarded all our key ecosystems, species and genetic diversity

Goal 4: We have ensured that the benefits from the utilisation of biodiversity are shared equitably

Goal 5: We have improved the capacity, knowledge and skills of all stakeholders to conserve biodiversity

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<sup>5</sup> National Policy on Biological Diversity 2016-2025. <<http://www.kats.gov.my/ms-my/PustakaMedia/Penerbitan/National%20Policy%20on%20Biological%20Diversity%202016-2025.pdf>>

<sup>6</sup> National Policy on Biological Diversity 2016-2025. <<http://www.kats.gov.my/ms-my/PustakaMedia/Penerbitan/National%20Policy%20on%20Biological%20Diversity%202016-2025.pdf>>

In a nutshell, the NPBD aims to harness the commitment and capacity of stakeholders to conserve biodiversity, reduce pressure on and safeguard key ecosystems biodiversity, as well as ensure equitable sharing of the benefits of biodiversity utilisation.

As part of the NPBD, Malaysia has introduced Act 795 – Access to Biological Resources and Benefit Sharing Act 2017. The Federal Government has also promised to keep at least 50% of its landmass as forestland.<sup>7</sup> In addition, in August 2019, the Ministry of Water, Land and Natural Resources (Kementerian Air, Tanah dan Sumber Asli or KATS) set up the National Biodiversity Roundtable (NBR) to advise the Minister on the direction and strategy of implementing the NPBD.<sup>8</sup> The Roundtable group consists of stakeholders from the Government, academia, private sector and Non-Governmental Organisations. The NBR also looks at the proposed framework for the Biodiversity Strategy in the 12<sup>th</sup> Malaysia Plan. Separately, the Federal Government is also looking to set up a Natural History Museum to showcase and protect biological sources in Malaysia.

Implementation of NPBD is yet to start in earnest especially at the state level, and biodiversity protection is yet to be mainstreamed into general policy-making even at the Federal level. Penang State currently does not have an implementation plan for NPBD.

### 1.2.2 Penang's Forest Resources

Penang's forests are under the jurisdiction of the Forestry Department (Jabatan Perhutanan Negeri or JHN). In Penang, permanent forest reserve (Hutan Simpan Kekal or HSK) accounts for around 5% of Penang's landmass, amounting to 5,100 ha.<sup>9</sup> Penang does not have production forest and all forests are currently managed for conservation purposes in accordance with the National Forestry Policy (Dasar Perhutanan Negara) and the National Forestry Act. Penang also has three High Conservation Value Forests (HCVF) – plots of forestland that are specially protected and monitored because they contain rare and valuable tree species.<sup>10</sup> Penang has one National Park<sup>11</sup> (which is the world's smallest) that is under the jurisdiction of the Department of Wildlife and National Parks Peninsular Malaysia (PERHILITAN) and one State Park<sup>12</sup> under the jurisdiction of the JHN. The JHN is also in charge of forest restoration and overseeing the timber industry in Penang. The JHN is assisted by the Forest Research Institute Malaysia (FRIM) in making evidence-based policy for the management of its forest and biodiversity. According to FRIM, there are 15,000 flora species in Malaysia, 165 of which are threatened species and

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<sup>7</sup> KATS, Forestry. <<http://www.kats.gov.my/en-my/forestry/Pages/default.aspx>>

<sup>8</sup> "Preserving our Biodiversity". *The New Straits Times*, 2<sup>nd</sup> August 2019.

<<https://www.nst.com.my/opinion/columnists/2019/08/509498/preserving-our-biodiversity>>

<sup>9</sup> Jabatan Perhutanan Negeri Pulau Pinang. Kedudukan Serta Keluasan Hutan Simpanan Kekal Di Pulau Pinang.

<<http://jhn.penang.gov.my/images/pdf/hsk.pdf>>

<sup>10</sup> Penang Forest Department, "Forest Biodiversity Protection in Penang" [Powerpoint Presentation], 28<sup>th</sup> August 2019.

<sup>11</sup> PERHILITAN, Penang National Park. <<https://www.wildlife.gov.my/index.php/en/public/2016-05-10-02-34-43/peta>>

<sup>12</sup> Penang Forest Department, "Forest Biodiversity Protection in Penang" [Powerpoint Presentation], 28<sup>th</sup> August 2019.



5 of these are found in Penang.<sup>13</sup> Penang National Park has also set up a species inventory and the process of data collection is ongoing.

The Government of Penang has made a commitment not to reduce the size of its HSK – if a forest in Penang is degazetted, the state needs to replace one with the same size – and has plans to plant 1 million trees per year.<sup>14</sup> Almost all forests in Penang are currently used for recreational purposes and access to them is open and free to all, including the virgin forests although access to this should technically be limited. Only certain forest areas surrounding dams are closed to the public. Despite being the state with the smallest forest coverage, Penang receives the second highest number of visitors to its forests in the whole of Peninsular Malaysia.<sup>15</sup> There is currently no political appetite to impose charges for the public to access forests for recreational use. Penang has also not established a payment for ecosystem services (PES) scheme for its forests and forest resources unlike Perak.

Going forward, the JHN is planning to gazette around 1,000 ha of mangrove and nipah forests as HSK – the effort is underway but the process has taken a long time due to resistance by various parties.<sup>16</sup> The JHN is also working with Universiti Sains Malaysia (USM), Penang Hill Corporation (PHC) and The Habitat to designate more than 2,000 ha of forests as research forest under the Rainforest Research Centre, which will be the largest in Malaysia.<sup>17</sup> The aim of the Research Forest is to attract domestic and foreign researchers to carry out scientific research and studies in Penang, subsequently contributing to the protection and enrichment of Penang's biodiversity. The focus of the Rainforest Research Centre will be on environmental conservation, climate change and long-term sustainable management of natural ecosystems in Penang. USM is an important stakeholder for understanding Penang's biodiversity and its School of Biological Sciences has a checklist of local flora and fauna. The establishment of the Research Forest will create a win-win situation for all parties. In addition to the Research Forest, the JHN also has plans to further develop forest-based eco-tourism in Bukit Panchor including implementing an entrance fee (the first to be levied by the JHN in Penang) as conservation charges.

Apart from forests actively managed by the JHN, there have been special efforts by the State Government and the private sector to showcase the rich flora and fauna of Penang. The most significant of these include the Botanic Gardens, PHC and The Habitat. The Penang Botanic Gardens cover a total area of 212 ha, 30 ha of which are built-up areas.<sup>18</sup> The Gardens have more than 100 years of history and their main objectives are to provide a safe and conducive public recreation environment, support conservation

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<sup>13</sup> Saw Leng Guan et al., "Conservation of some rare and endangered plants from Peninsular Malaysia", *Kew Bulletin*, vol. 65, no. 4, 2010, pp. 681–689. JSTOR. <[www.jstor.org/stable/23044635](http://www.jstor.org/stable/23044635)>

<sup>14</sup> Penang Forest Department, "Forest Biodiversity Protection in Penang" [Powerpoint Presentation], 28<sup>th</sup> August 2019.

<sup>15</sup> Private communication from Department of Forestry Penang on 27<sup>th</sup> August 2019.

<sup>16</sup> Penang Forest Department, "Forest Biodiversity Protection in Penang" [Powerpoint Presentation], 28<sup>th</sup> August 2019.

<sup>17</sup> Ibid.

<sup>18</sup> State Government of Penang, "Penang Botanic Gardens Draft Special Area Plan", Published in 2011. <<http://pht.org.my/botanic/botanic1.pdf>>

programmes, and promote education and awareness in the appreciation of nature and gardening. The Gardens currently receive more than 800,000 visitors per year and are governed by a Special Area Plan, which sets out the range of activities allowed within the Gardens and their future development.<sup>19</sup> The Botanic Gardens Department of Penang is in charge of looking after the Gardens although it does not have enforcement powers. The Botanic Gardens have a lot of potential for eco-tourism due to their close proximity to the city centre. New ideas to enhance their future use include the building of a canopy walk near the waterfall.

PHC was established in 2009 through a State enactment with the vision of promoting Penang Hill to be the Hill Resort of Choice in Malaysia. Its mission is to promote preservation and stewardship of the natural and historical heritage of Penang Hill through conservation, education, eco-tourism and so on. It has three main responsibilities: a) managing the funicular service; b) hill maintenance and landscaping; and c) infrastructure and tourism development. PHC is currently working with various government agencies to come up with the Penang Hill Special Area Plan (Substitution). It carries out a series of programmes to support its mission including Penang Hill Festival, Penang Hill Heritage Forest Challenge, Trash Free Hill, Nature Walks at Penang Hill and so on. It also has a small plant nursery to carry out plant nurturing activities. PHC, representing the Penang State Government, is currently working closely with government departments and with the technical expert support of The Habitat and USM to apply for the UNESCO Biosphere Reserve status for an area covering almost a quarter of Penang Island that encompasses both terrestrial and marine territories, including the Penang Hill, National Park and the adjacent sea Northwest of the Island.

The Habitat is a business establishment situated at the top of Penang Hill managed by a private company. It is a successful example of public-private partnership in managing and promoting Penang's natural assets. The Habitat has a long-term concession to build and operate The Habitat through the Penang State Government who is the contracting party represented by the State Secretary and managed through Chief Minister Incorporation (CMI). The Habitat is currently one of the top tourist attractions in Penang, focusing on enhancing the public's experience in learning about the flora and fauna on Penang Hill and conservation efforts. It is a win-win arrangement for the private company, which is profit-oriented and the state Government, which collects an income from leasing the land. The Habitat has also set up The Habitat Foundation to promote conservation research and education, which is non-profit oriented. In 2017, working with domestic and international partners, The Habitat organised the Penang Hill "BioBlitz" – a large scale multi-disciplinary study involving a large number of participants to identify and record the biodiversity of flora and fauna on Penang Hill. The one-off event significantly increased the interest of the public, as well as increasing knowledge of, and exposure to Penang's biodiversity. One of the significant findings of the study is the discovery of a species of highland vampire crab that is endemic to Penang Hill.

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<sup>19</sup> "Penang Botanic Gardens will blossom, promises curator". *Free Malaysia Today*, 30<sup>th</sup> November 2019. <<https://www.freemalaysiatoday.com/category/nation/2019/11/30/penang-botanic-gardens-will-blossom-promises-curator/>>

### 1.2.3 Penang's Aquatic Resources

The Department of Fishery (Jabatan Perikanan) or DOF is in charge of fishery resources in both the sea and inland water. Unlike forests, aquatic resources in Penang are currently managed for their production value as an important food and income source. The DOF adopts the Ecosystem Approach to Fisheries Management (EAFM) in managing fishery resources in Penang. It is responsible for the licensing of fishing vessels, overseeing aquaculture, collecting data for fishery resources, and planning for food security (fish and seafood related) in Penang. Its mission is to develop a dynamic fishing industry, promote sustainable, efficient and innovative development of marine resources, and professional service delivery.

The DOF also undertakes activities to protect and restore marine habitat, especially important nursery and breeding grounds, including building artificial reefs in Pulau Kendi. Among the nine species of corals found in Pulau Kendi, two are listed in the IUCN.<sup>20</sup> The DOF also promotes sustainable fishery management among fishermen and carries out conservation efforts such as the Sea Turtle Conservation Centre in Pantai Kerachut. The main law governing fisheries is the Fisheries Act 1985 (Akta Perikanan 1985) and the national government is currently working on the Fisheries Management Plan. At the national level, an inventory of fish stock is updated every ten years. The last fish stock inventory was taken in 2016 although the report is yet to be made available. At the State level, there is no detailed record of aquatic life and the changes that have taken place over the years in Penang. However, records of fish catches pertaining to commercial and coastal fisheries can be obtained from Lembaga Kemajuan Ikan Malaysia (LKIM).

There is currently no Marine Park or Marine Conservation Area in Penang. There are 42 Marine Parks in Malaysia and the nearest one to Penang is Pulau Payar Marine Park in Kedah.<sup>21</sup> The objective of Marine Parks is to protect and conserve marine habitat and life. USM's Centre for Marine and Coastal Studies (CEMACS) has identified a few potential areas that could be established as Marine Parks or Marine Conservation Areas in Penang, including the Middle Bank, Pulau Jerejak, Balik Pulau, Pulau Kendi and Kuala Muda. CEMACS has made a substantial contribution to Penang's marine and coastal protection over the years through carrying out scientific studies of Penang's marine ecosystem, and marine species cultivation and green aquaculture. In addition, CEMACS has also collected various coastal and marine biodiversity data in Penang.

The DOF is also in charge of inland fisheries (rivers) in Penang alongside marine fishing. DOF has a Seed Release Programme where it releases native fish seedlings into rivers to replenish fish stock. This takes place in Kampung Terus, Sungai Perai, Sungai Muda and Sungai Kerian. The DOF is also working with the Botanic Gardens to release fish for eco-tourism and education purposes where fish are trained to interact with humans. However, the success of the programme depends in large part on the quality of the waters, which is outside the purview of the DOF. The Department of Environment (Jabatan Alam Sekitar or JAS) is in charge of river water quality and the Department of Irrigation and Drainage (Jabatan Pengairan dan Saliran or JPS) is in charge of the overall river management for flood control purposes. There is not yet any department that is in

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<sup>20</sup> 2<sup>nd</sup> Biodiversity Working Group Meeting on 29<sup>th</sup> August 2019.

<sup>21</sup> Marine Park of Malaysia. <<http://marinepark.dof.gov.my/apa-itu-taman-laut.html?uweb=jtl&lang=en>>

charge of looking after the overall aquatic life and biodiversity of inland waters, which is reflected in the lack of information on river habitats in Penang. Also, there is a lack of a river watershed management plan, which would require the involvement of multiple departments.

#### 1.2.4 Wildlife and Species Protection

The Department of Wildlife and National Parks Peninsular Malaysia or PERHILITAN (which stands for Jabatan Perlindungan Hidupan Liar dan Taman Negara Semenanjung Malaysia) plays an important role in protecting wildlife under the Wildlife Conservation Act 2010 (Act 716) (Akta Pemuliharaan Hidupan Liar 2010 (Akta 716)) in Peninsular Malaysia. In Penang, the main roles of PERHILITAN are in the management of Penang National Park, human-wildlife conflicts as well as law enforcement in illegal wildlife trade and crime. Currently, PERHILITAN is in the midst of enforcing Wildlife Management Plan as one of the mandatory elements of any new development projects in order to protect wildlife and its habitat.

Other entities that are actively involved in species protection in Penang are the Malaysian Nature Society (MNS) and Langur Project Penang (LPP). MNS has been instrumental in identifying and protecting important habitats for birds in Penang, especially migratory birds. It has collected significant data on animals especially bird species in Penang prioritising endangered animals. The MNS has successfully applied for the recognition of Teluk Air Tawar as a Key Biodiversity Area (KBA) under the IUCN and is currently working to get Penang Hill to be recognised as a KBA too. KBAs are sites that contribute significantly to global persistence of biodiversity. These KBA sites in Penang can form the basis of a list of biodiversity “hotspots” that can attract tighter regulation on development of these sites in Penang. The LPP is set out to study and protect langur species in Penang. Spectacled langurs or dusky leaf monkeys are threatened species primarily found in Penang. Apart from gathering data about the life of langurs, LPP also carries out awareness raising campaigns and helped to build the first canopy bridge in Penang to allow animals to travel within the fragmented habitats. One of its main objectives is to reduce human-animal conflicts and promote co-existence.

#### 1.2.5 Urban Biodiversity

Given that more than 95% of Penangites live in urban areas, and that built-up areas will account for nearly 50% of Penang’s landmass by 2030,<sup>22</sup> the issue of urban biodiversity is becoming more important. The focus of urban biodiversity is to protect and preserve biodiversity in urban areas, which are also part of the biosphere. Urban biodiversity initiatives centre on biospheres that interact closely with humans such as urban greens, or animals in urban alleyways and parks. The importance and promotion of urban biodiversity can also be highlighted from a cultural angle such as the use of certain ingredients or plants for food or for the arts.

Urban biodiversity exists in both public and private spaces. In public spaces, the Department of Landscaping (Jabatan Landskap or JL) within local Governments is playing an important role in promoting and protecting urban biodiversity. Current practices of

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<sup>22</sup> Rancangan Struktur Negeri Pulau Pinang 2030.

<[http://epublisiti.townplan.gov.my/turun/rsn\\_pulaupinang2030/rsnpp2030.pdf](http://epublisiti.townplan.gov.my/turun/rsn_pulaupinang2030/rsnpp2030.pdf)>

single-species tree planting and artificial landscapes dominate the approach taken by the JLS. Apart from cost consideration, there is also a lack of knowledge of holistic planting design that enhances urban biodiversity not only for flora but also fauna species. In Penang, JLS do not work closely with experts from the Botanic Gardens or USM in planning for urban landscape due to lack of a formal relationship and resource constraints. In some cases, 'rewilding' of landscape not only increases biodiversity but also reduces the maintenance cost. Singapore provides a good example of how taking a scientific approach to public landscaping can increase urban biodiversity.

Another avenue for addressing urban biodiversity is through urban farming. Most urban farmers focus only on yield and do not really look into biodiversity issues. The roles of pollinators, pests or natural predators need to be understood properly so that urban farming can benefit from urban biodiversity and vice versa. Other major initiatives in Penang where elements of urban biodiversity should be explored are the Green Connectors project and blue-green infrastructure for flood management. The former aims to create not only more green public spaces but also acts as a climate adaptation measure particularly in reducing urban heat island effect. Regarding the latter, the Government is looking into building more nature-based infrastructure to store and slow down stormwater runoff such as ponds, parks and vegetated swales. These infrastructure projects can also serve to enhance urban biodiversity in Penang.

## 2. Long-Term Goals

In order to enhance biodiversity protection in Penang, the Biodiversity and Natural Ecosystems Working Group recommends that the State Government adopt the following targets:

- a. To rehabilitate Sungai Pinang (Class III) and Sungai Perai (Class III) by 2030 so that they achieve Class I of the Interim National Water Quality Standards (INWQS).<sup>23</sup>
- b. To establish 2 areas in Penang as Marine Conservation Areas by 2022 and to gazette Teluk Air Tawar as forest reserve as soon as possible.
- c. Penang acquired a UNESCO Biosphere Reserve listing by 2025.
- d. Gazettement of all mangrove forests in Penang by 2025

## 3. Main Challenges and Gaps

3.1 Penang currently **does not have a centralised biodiversity inventory or database**, although different departments and non-government stakeholders collect different data.

3.2 Penang does not have officially recognised '**biodiversity hotspots**' where special protection can be put in place to preserve important species or habitats. There is also no

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<sup>23</sup> Laporan Kualiti Alam Sekeliling 2017. <[http://www.data.gov.my/data/ms\\_MY/dataset/senarai-sungai-tercemar-dan-kelas-kualiti-air-berdasarkan-bod-an-dan-ss/resource/0ee61053-db28-4fb4-ad7a-7eb25624e8d3](http://www.data.gov.my/data/ms_MY/dataset/senarai-sungai-tercemar-dan-kelas-kualiti-air-berdasarkan-bod-an-dan-ss/resource/0ee61053-db28-4fb4-ad7a-7eb25624e8d3)>

one body to oversee the protection and management of biodiversity in Penang.

3.3 There is a **lack of any science-based approach** to decision-making i.e. impact on biodiversity including decisions aimed at promoting sustainable and eco-tourism.

3.4 There is a **lack of enforcement capacity** when it comes to the protection of forest resources especially as most forests are open for public access – problems of forest encroachment and theft of valuable tree species are symptoms of this.

3.5 The State Government has yet to introduce plans to implement the National Policy for Biological Diversity, stemming partly from the fact that there is a **lack of recognition of the value of biodiversity** by the public and government.

3.6 Penang has **limited green spaces** due to various reasons including land use pressure, urban sprawl and reluctance to create green spaces due to cost consideration. Even in existing public green spaces especially in urban settings, the relevant government departments do not give enough importance to, and **lack the relevant knowledge of urban biodiversity**. Apart from single-species tree planting, road-widening and other activities are encroaching on the space of existing urban trees. Maintenance cost is usually the main consideration when it comes to public space design rather than the benefits of enhanced urban biodiversity.

3.7 Marine biodiversity in Penang is threatened by the following:

- **Lack of comprehensive data** on marine life and habitat.
- **Land reclamation projects** that disturb and destroy marine habitat.
- **Sea water pollution** and lack of effective monitoring of water quality.
- **No marine conservation areas** in Penang – marine biodiversity is even less visible than terrestrial biodiversity hence there is very little interest to prioritise this.
- Lack of **State-level Fishery Action Plan**.
- Existing turtle protection programme has not been very successful.
- Lack of resources to protect and enhance marine biodiversity – **limited financial resources** within the DOF and limited options to receive outside funding.

3.8 Inadequate protection of inland waters has resulted in Penang having some of the **poorest quality rivers** in Malaysia. Penang does not have an integrated river management system and different government departments have different jurisdictions over rivers and their use. As a result, inland water ecosystems have been generally neglected.

3.9 **Fragmented and degraded habitats** threaten the survival of species in Penang. Current species protection focuses on wildlife relocation to accommodate new developments rather than on how to create a thriving environment and maintain habitat integrity for local wildlife in harmony with development.

3.10 There is a **lack of knowledge and appreciation** among the public regarding natural ecosystems and biodiversity. This is translated into a lack of interest in protecting

important species and habitats. A human-centric approach to development also does not highlight the need for coexistence with wildlife. In addition, the “out of sight, out of mind” attitude means the local population are increasingly detached from what Penang’s nature has to offer.

3.11 The **absence of monetary value** assigned to biodiversity and natural assets also causes ignorance of, and disinterest in habitat and species destruction in Penang. Although a subset of the population enjoys going to local parks or iconic landmarks such as the Penang Hill, most people still see natural ecosystems and biodiversity as free goods and services that have no intrinsic value. This results in the lack of momentum in pushing for the adoption of biodiversity-friendly policies.

3.12 **Lack of sustainable funding** for better site management for forests, rivers, parks and marine hotspots means biodiversity-rich areas may not be optimally protected. Currently, most of these public areas are open to public access without charge, which means the cost of maintenance has to be met by the already overstretched departmental budget.

## 4. Solutions

### 4.1 Governance and Data

4.1.1 Penang should establish a **Biodiversity Centre or Unit** that not only oversees biodiversity protection in Penang but also acts as one of the five national biodiversity centres to be set up under the National Policy on Biological Diversity (NPBD).

- The Centre should be a quasi-Government entity that is co-run by Non-Government experts (such as scientists and universities).
- The mandate to set up the Centre should be established by a **State Policy on Biodiversity**, which acts as the implementing instrument for NPBD.
- The Centre should oversee biodiversity of all types of ecosystems including forests, maritime, rivers, caves, and urban biodiversity.
- The Centre should be consulted on decisions (especially on land development) that will have a significant impact on biodiversity in Penang.

4.1.2 The State Government should start to collect and collate all **biodiversity-related data**, including important species of flora and fauna in Penang.

- Apart from species directory, Penang also needs to have data on its unique or important ecosystems.
- These data should be used to guide decision-making on land use and planning to ensure that important areas or species continue to be protected.
- Data-sharing of biodiversity in Penang should not be too restrictive as to frustrate genuine scientific research interests.

4.1.3 Penang should establish a **State-level fish stock inventory** to keep track of and effectively manage one of its most important marine resources.

- The Department of Fishery and the State Government should work with the private sector to conduct a “Bio Blitz” equivalent exercise for its marine ecosystems.

- This should be done as a measure to promote Penang’s “blue economy”, which is the sustainable use of ocean resources for economic growth, improved livelihoods and job creation.

4.1.4 Penang should have a **body or authority with a clear mandate to manage its rivers in an integrated fashion**. River management in Penang should also include protection of its aquatic ecosystems, which currently is not within the scope of any Government department.

- The custodian of Penang’s rivers could be either the Mayors of MBPP and MBSP, or an upgraded Badan Kawal Selia Air. The latter can become the overarching authority for all freshwater resources in Penang.
- The river custodian can work closely with the Biodiversity Centre or Unit to carry out river rehabilitation and protect river ecosystems.

## 4.2 Biodiversity Protection

4.2.1 Penang’s natural ecosystems and biodiversity should be included and celebrated as part of **Penang’s heritage**. Like the George Town Festival, which celebrates Penang’s cultural heritage, Penang should organise an annual Festival to celebrate Penang’s natural assets.

- Celebration of Penang’s natural heritage including hills and beaches should be promoted locally and internationally.
- Protection of Penang’s natural heritage should also be promoted in schools and within the Government, as well as among the business community.

4.2.2 Designate **biodiversity “hot spots”** or protected areas in Penang and impose strict restrictions on their use or development.

- Biodiversity “hotspots” can be species (e.g. bird areas) or ecosystems (e.g. seagrass bed, coral reefs) specific. They can also include important migratory corridors for unique species.
- These “hot spots” must be clearly identified in Land Use Plans and should be given adequate protection such as through legal gazettelement.
- Penang should aim to set up Marine Conservation Areas in Penang to protect and rehabilitate its marine biodiversity.

4.2.3 Create a **“liveable” Penang for all types of creatures** including Penang’s flora and fauna.

- The Penang2030 vision to make Penang a more liveable city by 2030 needs to take into account creating a better living environment for all its animals and flora as well as people.
- The aim should be reflected in the overall strategy of Penang’s future growth.
- The State Government should set targets and indicators to make sure that this objective is achieved.

4.2.4 To make sure that future development does not further reduce or restrict the habitat of wild animals (e.g. langurs), more **animal-friendly infrastructure such as canopy bridges** should be constructed.

- Construction of canopy bridges or similar infrastructure needs to be incorporated



in local planning decisions.

- There should be legal requirements for local Governments or developers to consider the construction of this infrastructure if it has been shown that new developments will affect the movement of wild animals.
- Better awareness or education on human-animal coexistence needs to be promoted among residents living in close proximity with wild animals to reduce conflict.

### 4.3 Urban Biodiversity

4.3.1 The requirement of **10% “public space”** imposed on new development needs to be further refined to specify the types of desirable space e.g. green, multiple species trees or plants, non-linear tree planting etc.

- The newly proposed Department of Stadium and Open Spaces in Penang can take over some of the maintenance of parks and open space to allow more sophisticated planting of municipal trees in Penang.
- Landscape Departments of Local Governments should adopt the practice of rewilding Penang’s urban landscape, which will require less maintenance and can promote urban biodiversity.

4.3.2 The State Government should adopt an **Urban Biodiversity Plan** or Policy to lay out how to use urban spaces to enrich local biodiversity.

- Urban Biodiversity Plan should be combined with or incorporated into other relevant policy areas such as the use of **blue-green infrastructure for stormwater management**, the creation of **Green Connectors** (which also targets using green engineering to reduce urban heat island effect) as well as the **Urban Farming Masterplan**.
- Urban Biodiversity Plan or Policy should provide guidance on promoting science-based and rational landscaping in Penang.
- The Landscape Department at the State and Local Government level should consider adopting or using the City Biodiversity Index (CBI) or the Singapore Index on Cities’ Biodiversity (SI) as a self-assessment tool to evaluate and monitor the progress of their biodiversity conservation efforts.<sup>24</sup>

4.3.3 In addressing urban issues or problems such as waste management, flood mitigation, sewage treatment etc, **sustainable urban solutions** (especially those involving green infrastructure) should be prioritised. This is to ensure that urban solutions do not conflict with the need to protect urban biodiversity.

### 4.4 Biodiversity Financing

4.4.1 The State Government should collaborate with the Ministry of Economic Affairs to design a **biodiversity financing (BioFin) plan** for Penang. Penang can tap into the existing BioFin capacity-building initiatives at the national and international level to identify future financing needs and a credible financing plan for biodiversity protection. This

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<sup>24</sup> City Biodiversity Index (CBI) or the Singapore Index on Cities’ Biodiversity (SI).

<<https://www.nparks.gov.sg/biodiversity/urban-biodiversity/the-singapore-index-on-cities-biodiversity>,  
<https://www.cbd.int/subnational/partners-and-initiatives/city-biodiversity-index>>

BioFin plan will be crucial in facilitating the implementation of NPBD in Penang.

- Apart from assessing the financial cost of protecting Penang's biodiversity and natural ecosystems, Penang should also calculate the "cost of inaction" i.e. future losses resulting from the failure to protect Penang's biodiversity etc. This will further clarify the choices and trade-offs policy makers have with regards to Penang's natural environment at any specific time.

4.4.2 The State Government should task the Biodiversity Centre or Unit to look into setting up **Payment for Ecosystem Services (PES)** in Penang. PES can apply to all important ecosystems including forests, rivers and the ocean.

- PES should target ecosystems and bio-diverse areas that are unique or important to Penang and the region.
- The Government can first focus on imposing PES on entities that derive direct benefits from the use of these ecosystems such as water consumers, park users and even farmers.
- Revenues from PES should be reserved for the protection and rehabilitation of Penang's natural ecosystems.

4.4.3 Further develop sustainable **eco-tourism** in Penang as a sustainable income stream to pay for biodiversity and ecosystem protection.

- To facilitate the establishment of world-class eco-tourism sites either through private or public-private initiatives, the State Government should work with national and international bodies to set up guidelines and standards for sustainable eco-tourism.
- To protect important ecosystems, the State Government should prioritise high standard ecotourism over other types of development in these areas.

4.4.4 The State Government should set up a **Trust Fund for Biodiversity Protection** with a clear mandate to receive and disburse funding for the protection of Penang's biodiversity and natural ecosystems.

- The Fund can be managed by the Biodiversity Centre or Unit and can receive funding from private and public sources.

#### **4.5 Environment Education and Research**

4.5.1 The Government should work with various partners (including NGOs, research institutes, private businesses) to further strengthen **environmental education and awareness of Penang's natural ecosystems, flora and fauna**.

- Penang should adopt a strategy to promote awareness among the general public of the value of its natural heritage. Specific species of flora and fauna can be used as ambassadors for public engagement and education.

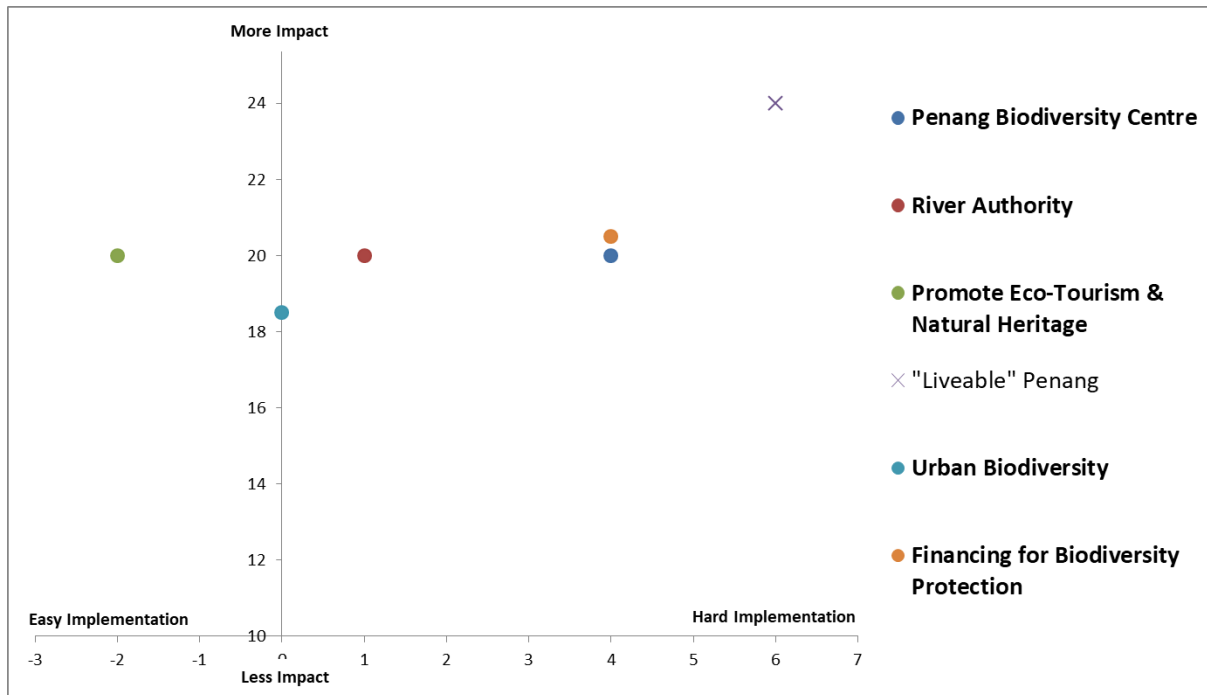
4.5.2 Penang should actively **promote research** on its natural ecosystems and biodiversity through more national and international collaboration, such as the BioBlitz of Penang Hill.

- The State Government can attract researchers by adopting clear guidelines on access and data sharing (using the Access and Benefit Sharing (ABS) Clearing

House).

- The State Government should work closely with the Federal Government in making sure that access to genetic resources and information is not too restrictive for effective research collaboration.

## 5. Major Policy Recommendations and Milestones



### 1. Urban Biodiversity (2020)

Penang is one of the most urbanised states in Malaysia where built-up area is expected to reach about 50% of its landmass. Although Penang's forest reserves are protected, they only account for 5% of its land area. This means that biodiversity protection is not only important in forests but also in the urban setting. To help enhance and protect its urban biodiversity, the State Government should adopt an **Urban Biodiversity Policy** or Plan to lay out how to use urban spaces to enrich local biodiversity. The Policy can provide guidelines, which can be incorporated into the relevant plans, on how urban planting can be carried out to maximise the potential for biodiversity. This is particularly true for landscaping activities on state and council land. Local Governments invest a lot of money in public landscape every year but the design of landscape is very much driven by cost-saving considerations, i.e. which species or types of planting can minimise maintenance cost. This results in single-species and linear planting. The lack of an urban biodiversity focus or policy also means trees and plants have too easily been sacrificed for houses or roads. Instead, an Urban Biodiversity Policy can facilitate the adoption of **nature-based solutions in addressing urban challenges** such as the use of **blue-green infrastructure for stormwater management**, the creation of **Green Connectors** (which also targets using

green engineering to reduce urban heat island effect) as well as urban farming. Rewilding of the urban landscape, for example, can promote urban biodiversity and provide urban corridors for wildlife while also reducing maintenance cost. Having an urban development plan that is sympathetic to the survival of urban wildlife is consistent with making Penang a liveable place for all types of creatures, not just people.

## **2. Promote Penang's Eco-Tourism and Natural Heritage (2021)**

Penang State and Local Governments need to recognise the economic value of Penang's rich ecosystems and biodiversity, which can be promoted through eco-tourism and cultural celebration. Penang has set precedents of world-class standard eco-tourism operations such as The Habitat, Tropical Spice Garden, Entopia etc, which are the blueprints for future development of ecotourism (including cottage industries) in Penang. The Government should also invest in capacity building and work with state and federal agencies that own the various parks to promote preservation and conservation of Penang's natural heritage (e.g. through the creation of nature trails, education programmes and so on). In particular, **eco-tourism needs to be prioritised** over other types of development in areas with important ecosystems (or biodiversity hotspots), such as hill forests, mangrove forests, and pristine coastal areas and rivers. Penang's eco-tourism industry can also be boosted through the **celebration of Penang's natural heritage** either via existing festivals such as George Town Festival and Penang Hill Festival or new festivals to coincide with World Biodiversity or Ranger Day. Bio-cultural elements of Penang's biodiversity, such as specific cultural activities involving local species or the role of biodiversity in Penang's cuisine should be highlighted. In relation to the latter, the importance of biodiversity in Penang's culinary richness can be emphasised in Penang's celebration of foods (such as through Penang International Food Festival). To complement Penang's eco-tourism and heritage celebration, the Government should also work with various partners (including NGOs, research institutes and private businesses) to further strengthen **environmental education and awareness** around Penang's natural ecosystems, flora and fauna. Specific species of flora and fauna (such as the vampire crab that is endemic to Penang Hill) can be highlighted as ambassadors for public engagement and education. Penang's biodiversity should be incorporated into and highlighted in Penang's major promotion of ecotourism as well as cultural festivities by 2021.

## **3. Penang Biodiversity Centre (2021)**

Penang should establish a **Biodiversity Centre or Unit** that not only oversees biodiversity protection in Penang but also acts as one of the 5 national biodiversity centres to be set up under the National Policy on Biological Diversity (NPBD). The Centre will oversee biodiversity of all types of ecosystems including forests, maritime, rivers, caves, and urban biodiversity. The mandate to set up the Centre should be established by a **State Policy on Biodiversity**, and it can be a quasi-Government entity co-run by Non-Government experts (such as scientists and universities). The Centre should have the mandate to collect and collate all **biodiversity-related data**. Furthermore, given the relatively scarce information on Penang's marine ecosystem, the Centre should prioritise

working with the Department of Fishery in gathering data especially a **state-level fish stock inventory** to keep track of this important food source for Penang. This can be done through public-private collaboration on a “Bio Blitz” equivalent exercise for the marine environment. The Centre should also come up with short- and long-term plans on biodiversity protection in Penang. Once biodiversity data is collected, which can include a species directory, the Centre should designate **biodiversity “hot spots”** or protected areas in Penang. Biodiversity “hotspots” can be species (e.g. bird areas) or ecosystems (e.g. coral reefs) specific. They can also include important migratory corridors for unique species. Based on these hotspots, the State Government can establish the first Marine Conservation Areas in Penang. These “hot spots” must be clearly identified in Land Use Plans and should be given adequate protection such as through legal gazettelement. Another task of the Centre is to promote research collaboration on its natural ecosystems and biodiversity, which requires clear guidelines on material access and data sharing. It should also undertake studies to establish the intangible value of biodiversity. More importantly, the Biodiversity Centre should be consulted on the planning and decisions on land development that are most likely to have a significant impact on biodiversity in Penang.

#### **4. Financing for Biodiversity Protection (2022)**

In line with the national biodiversity policy, the Penang Government needs to secure sufficient funding to protect biodiversity in Penang. The State Government can utilise the **national initiative on BioFin (biodiversity financing)** to build capacity in assessing financing needs and exploring viable financing avenues for future biodiversity protection. For example, the State Government should aim to set up the **Payment for Ecosystem Services (PES) scheme**. This scheme should target ecosystems and biodiversity that are unique or important to Penang and the region, and entities that derive direct benefits from them such as water consumers, park users and even farmers. In addition, the State Government can also set up a **Trust Fund for Biodiversity Protection** with a clear mandate to receive and disburse funding for biodiversity protection purposes. Funding can come from public and private sources. The PES scheme and Trust fund can be managed by a Biodiversity Centre or Unit dedicated to protecting and enhancing biodiversity in Penang and the region. Once the Trust Fund is set up, it can become a vehicle for receiving international funds such as through dedicated funds (e.g. Adaptation Fund) or carbon offset schemes. Use of revenues from the PES scheme or Trust Fund should be limited to biodiversity protection activities and nothing else. Apart from understanding the cost of biodiversity protection, the State Government also needs to understand the cost of inaction, i.e. future losses resulting from the failure to protect Penang’s biodiversity etc. This will further clarify the choices and trade-offs policy-makers have with regards to Penang’s natural environment at any specific time.

## 5. Integrated River Authority and Integrated River Basin Management (2023)

There is currently no one agency that is responsible for looking after river ecosystems in Penang – the Department of Drainage and Irrigation (JPS) is in charge of drainage and irrigation; Department of Environment (JAS) is in charge of water quality; while the Department of Fishery is in charge of inland fisheries. Penang also does not have an integrated river management regime, which means no-one takes the responsibility for rehabilitating rivers and ensuring that rivers are used sustainably. As a result, almost all of the big rivers are severely polluted. Rehabilitating rivers not only helps revive aquatic ecosystems, it can also increase water security as Penang rivers are an alternative source of water supply. There should be a **body or authority with a clear mandate to manage Penang's rivers in an integrated fashion**. This body must be able to take action against sources of river pollution such as illegal dumping and discharging from domestic users. The custodian of Penang's rivers could be either the Mayors of MBPP and MBSP, or an upgraded Bahagian Kawal Selia Air, which is put in charge of looking after Penang's water catchment areas. The JPS could also be a good candidate as they are already in receipt of funding for river management, although there are concerns about their lack of capacity in adopting a "softer" approach (as opposed to concrete-based engineering solutions) to whole-ecosystem river management. The river authority / custodian can work closely with the Biodiversity Centre or Unit to carry out river rehabilitation and protect river ecosystems. Penang also needs to accelerate the adoption of the Integrated River Basin Management approach to make sure that all uses of the rivers and the surrounding land are governed in an integrated manner.