



# PENANG GREEN AGENDA 2030

Title: Marine and Coastal  
Management

Prepared by : Marine and Coastal Management  
Working Group  
Division : Think Tank & Policy  
Date : June 2020

## EXECUTIVE SUMMARY

Penang's coasts and sea are mainly used for fishing and aquaculture, shipping, recreation and conservation, and land development (e.g. land reclamation). Various government agencies have jurisdiction over their use including the Department of Fishery, Marine Department and Department of Environment. Penang Port is the busiest and most important commercial port in the Northern Region, which is managed by Penang Port Commission. The importance of Penang's sea for commercial shipping and cruises will increase as the Port and Swettenham Pier Cruise Terminal undergo ambitious expansion plans. Rapid Ferry also operates commuter services between the Mainland and Island and Penang Transport Master Plan also provides for the creation of new water taxi services in the near future.

Penang is also a major producer of fish and seafood in Malaysia. As fish catches decrease, the State Government and the Department of Fishery have encouraged the development of the aquaculture sector as a source of income and to compensate for the negative trend in fish landing. Penang still has stretches of mangrove forests dotted along its coastlines, which provide fish breeding grounds as well as an important habitat for other animals such as birds. In terms of marine biodiversity, Penang also has a small seagrass area and some coral reefs off one of its islands; however, there is currently no special marine protection area in Penang. Penang's coastline is dominated by residential, commercial and industrial development, agriculture and recreational use. Current and future land reclamation projects concentrate on the eastern and southern coastlines of the Island, and middle and southern parts of the Mainland.

The sea and coastal areas of Penang face severe challenges. Firstly, Penang does not have enough information about all its marine resources, including the types of marine species, their habitat, quantity and how these have changed over the years. There is also no comprehensive forecast of how current uses and future climate change impact will affect the sea and its marine resources. And given the rapid development of the aquaculture sector, there is not yet any detailed study on the capacity of the sea, nor efforts to identify the most suitable areas to carry out the activities. Without these data, Penang will not be able to make rational plans for the use of its marine and coastal resources in a sustainable fashion. Penang currently also does not have an integrated coastal management plan.

One of the most immediate threats to marine life in Penang is land reclamation. There are real concerns that the past and future reclamation projects will cause irreparable damage to breeding and fishing grounds, further harming the livelihood of fishermen and Penang's food security. However, land reclamation, if done thoughtfully, can protect the existing coast from the threat of sea-level rise. Another immediate and serious threat to marine life is water pollution. Pollution from ships, aquaculture, coastal discharges (via rivers and drains) and coastal development has made Penang's sea technically unsafe even to swim in (pollution is carried around the Island by water flow and tidal changes).

On top of this, Penang's sea and coast are already suffering from the negative impact of climate change, which includes sea-level rise, increased ocean acidity and higher sea water temperature. The latter two will adversely affect fish species and quantities, hence reducing

the productivity of Penang's "Blue Economy" and directly affect Penang's food security. In addition, continuous sea-level rise will see low lying areas like Nibong Tebal, Parit Buntar (Perak) and Bagan Serai (Perak) inundated with sea water, which will also affect rice production in these areas. Lastly, Penang has not set aside dedicated marine conservation areas, which shows that current economic uses of the coast and sea are prioritized over conservation. It also illustrates that Penang has not fully explored the potential of marine eco-tourism.

The MCM Working Group proposes the following five recommendations to create a thriving ecosystem for long term sustainability of marine and coastal areas in Penang:

### **1. Fishery Impact Assessment (2020)**

In order to safeguard Penang's food security and protect our fishery resources, all marine and coastal development projects requiring Environmental Impact Assessment (EIA) should also be subjected to Fishery Impact Assessment. The Department of Environment (DOE) should include this as a mandatory requirement in the EIA. The purpose of the requirement is for project developers to present a realistic forecast regarding the impact of the development on fishery resources. Data collection should be thorough, to include field survey, and not solely dependent on Department of Fisheries (DOF) statistics. Apart from individual EIAs, the State Government should also take steps to make sure that the cumulative impact of Penang's coastal and marine development is captured in its Overall Fishery Impact Assessment, which should be carried out annually or bi-annually by the State Government. This can be included in a Penang State Fishery Action Plan.

### **2. Gazetting of Mangrove Forests (2020-2021)**

Penang still has a few patches of mangrove forests, which are mainly concentrated in Barat Daya (BD), Seberang Perai Utara (SPU) and Seberang Perai Selatan (SPS) areas. Mangrove forests are home to a wide array of species and act as a natural buffer against erosion and extreme weather events. By preserving mangroves, Penang is not only protecting its food security but also its rich biodiversity. Currently, mangrove forests are under threat from development and aquaculture activities. It is recommended that the State Government include the gazetting of mangrove forests in the Structure Plan (RSNPP 2030), which is currently being finalised, before Local Plans are adopted. Gazetting can start at selected areas (e.g. SPU or Batu Maung). To further enhance the protection of mangroves, gazetting should also be accompanied by an additional layer of protection such as classifying mangrove forests as Category I to V under the IUCN Protected Areas, or as RAMSAR protection sites. This will make it more difficult for the de-gazetting of mangrove forests in the future.

### **3. Land Reclamation Assessment and Masterplan (2020)**

Given the ongoing and proposed land reclamation activities in Penang, it is imperative that Penang adopts a Masterplan for Land Reclamation as soon as possible. The purpose of the Masterplan is to identify: the geographical suitability of land reclamation in Penang, guidelines and standards that need to be adhered to, and future developments allowed on the land. Another urgent issue the State Government needs to address is assessing the cumulative impacts of land reclamation projects on Penang. Currently, land reclamation projects are assessed individually (with a level of assessment dependent on the size of project) without taking into account the cumulative impacts of past, on-going and planned projects, including the impact of sand mining activities. The holistic assessment of reclamation projects should include an independent, comprehensive coastal hydrodynamic study to assess the cumulative impacts of present and future/planned projects. This can be assisted by requiring future developers of reclaimed land to install sensors in permanent stations to monitor water quality on a continuous basis. The results of the assessment should be reflected in both Structure Plan and Local Plans, and should be monitored consistently. In the long term, the Land Reclamation Masterplan and cumulative impact assessment can be incorporated into the Integrated Coastal Zone Management Plan (ICZM) as and when it is adopted by the State Government.

### **4. Marine Conservation Areas (2020-2023)**

Penang should propose to the Federal Government to establish Marine Conservation Areas (MCA) in Penang. This is in line with the National Biological Diversity Policy of Malaysia and it will allow sensitive and valuable sea areas surrounding Penang to be protected. Unlike Marine Protection Areas (MPA), MCAs allow small scale and local fishing activities to take place within the area. CEMACS has already identified potential areas for conservation and protection, including the Middle Bank (seagrass), Pulau Gazumbo and Pulau Kendi, among others. The Middle Bank is the second largest seagrass bed in Peninsular Malaysia and serves as a valuable conservation area. It is also situated at the narrowest point between the island and mainland. This means that any land reclamation happening is going to result in distribution of sediments around the island. Due to its proximity to the George Town World Heritage site, it can also be turned into an eco-tourism destination. On the other hand, Pulau Gazumbo covers a large and pristine area, with very little existing economic activities and human impacts, which makes it an ideal place for MCA. However, currently some of the shortlisted areas have been demarcated as land reclamation areas in the State Structure Plan (RSNPP) so the discrepancy needs to be addressed. The State Government should also explore the possibility of establishing a sizable multi-use MCA instead of independent small MCAs, thereby enhancing connectivity and health of these areas.

## **5. Coastal Resilience Strategy (2025)**

Given Penang's extensive coastlines, Penang State Government needs to understand the threat of climate change on its coasts and take precautionary steps to improve coastal resilience. It is an established fact that climate change is and will continually cause sea-level rise globally, with Asia being impacted the most. It is therefore recommended that the Penang State Government adopt a Coastal Resilience Strategy that sets out the long-term objectives and main components of coastal protection. The State and Local Governments can work with national and international organisations to better understand the impact of climate change at the local scale, including mapping of new coastlines following sea-level rise, and identifying the necessary measures to enhance resilience. Among the measures it needs to take are: exploring new coastal engineering practices, research into saline-tolerant crops and farming, growing alternative food sources from more tolerant habitat, and protecting the George Town Heritage Site. It also needs to look into the issues of soil erosion and marine pollution. Adaptation and resilience measures need to be incorporated into Local Plans. References can be made to the Coastal Enactment of JPBD (PLANMalaysia), the National Coastal Erosion Studies by JPS, as well as the Garis Panduan Perancangan Pantai introduced by the State of Perak.

### **1. Background**

#### **1.1 Penang Green Agenda 2030 and Marine and Coastal Management**

Marine and Coastal Management is one of the ten key focus areas that have been identified as important areas for Penang to achieve its sustainable development goals. This is because Penang and the sea are inseparable: Penang Island is surrounded by it and Seberang Perai also has a long coastline. In fact, the Pearl of the Orient has derived its title from its beautiful beaches, biodiversity and impressive waters. Over the past few decades, Penang's sea and beaches have come under pressure from rapid economic development. Industries, houses, intensive farming and even landfill sites have polluted Penang's coast and coastal water. Discharges from our dirty rivers also contribute to the deterioration of our coastal waters. The busy shipping lane and ports, overfishing as well as the blooming aquaculture sector have affected our marine ecosystem and caused marine pollution. Yet, Penang still lacks a strategy or comprehensive policy to regulate and protect our coast and marine ecosystem.

The not so well-planned coastal development and pollution will continue to depreciate our coastal and marine environment if left unaddressed. It will affect not only our health and quality of life, but also frustrate future development (especially our tourism sector) and impact on our food supply. More importantly, it is already damaging our marine ecosystem and may one day destroy the very thing that has defined Penang for the last couple of centuries - our sea and coastal beauty. We therefore need a plan that ensures our coastal and marine resources are used sustainably and properly managed. We need to make sure that the Pearl of the Orient can withstand and be enhanced by the continuous development that has so far brought prosperity and improved quality of life to Penangites.

The Working Group aims to identify long term goals for Penang's coastal and marine management. It begins by identifying current trends of coastal and marine development such as tourism, land reclamation, fishing, aquaculture etc., and their main social, environment and economic impact. It also critically assesses Penang's current marine and coastal regulatory and policy framework, as well as identifying gaps and challenges in achieving Sustainable Development Goals by 2030. To move the issue forward, the Working Group identifies basic principles governing coastal and marine resource use as well as institutional innovation that will help to protect and rehabilitate our marine ecosystem. It also focuses on the need and scope for a marine conservation strategy, current and future impacts of climate change and how to make our coast more resilient. It also looks into the issue of food security and how to enhance yield not just for now but also in the long term. Lastly, it briefly explores the expansion of the use of our coast and sea for commuter transportation such as water taxis.

## **1.2 Current Situation**

A few Government bodies have jurisdiction over the use of Penang's coast and sea, which concentrates on fishery, shipping, conservation and land development. The Marine Department (Jabatan Laut Malaysia) is responsible for developing and implementing Marine Safety, Ship Safety, Marine Management, Port Facility Security and Marine Training Operations so that the services rendered to the stakeholders are satisfactory and meet international standards and national laws. It is also responsible for the safety of Penang's marine territory, manages pollution caused by oil spill, and manages and controls licensing for ships. It operates under the purview of three main national laws, which are the Merchant shipping ordinance 1952-Peninsular Malaysia and Labuan, Merchant shipping ordinance 1960-Sabah, and Merchant shipping ordinance 1960-Sarawak.

The Department of Fishery (Jabatan Perikanan or DOF) 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 main law governing fisheries is the Fisheries Act 1985 and the national Government is currently working on the Fisheries Management Plan.

In relation to conservation and environmental protection, the Forestry Department (Jabatan Perhutanan or JHN) has jurisdiction over mangrove forests. Currently, 381.04 ha of mangrove forests have already been gazetted as Permanent Reserve Forest (Hutan Simpanan Kekal), with 664 ha yet to be gazetted.<sup>1</sup> The Department of Environment (Jabatan Alam Sekitar or JAS) monitors the river and marine water quality through monitoring stations dotted around Penang. Penang does not have a marine park or protected area but the National Park of Penang (Penang Taman Negara) does cover a small strip of sea.

---

<sup>1</sup> Penang State Forestry Department, Kedudukan Serta Keluasan Hutan Simpanan Kekal Di Pulau Pinang, 1<sup>st</sup> September 2018, <<http://jhn.penang.gov.my/images/pdf/hsk.pdf>>.

Penang's Department of Irrigation and Drainage (Jabatan Pengairan dan Saliran or JPS) has a River Basin Management Division under the Coastal Zone and Business Sectors section. DID is charged with river maintenance through programmes of maintenance and conservation of Penang's rivers to protect life, property and recreational facilities along the river corridor. DID also advises the Government on issues of coastal zone management with the aim of achieving sustainable management of Penang's coast. It also implements coastal erosion control projects in all critical areas and a coastline management plan to reduce negative impacts of coastal erosion. DID collects data on coastal engineering to detect corrosion for various government departments and agencies in the planning and design of specific projects and for research purposes.

In terms of land development, especially land reclamation, a host of Government agencies are involved including the local authority. However, the main 'guardian' of environmental health is still the Department of Environment, which needs to approve the Environmental Impact Assessment (EIA). The Department of Fishery can also ask for Fishery Impact Assessment as part of the EIA. In addition, the Penang Government has also introduced a Social Impact Assessment (SIA) for the Penang South Reclamation project.

Fishery is the main marine activity in Penang. There are three different sub-sectors within fisheries: capture fisheries (accounting for 77% of fishery output nationally), aquaculture (22% of fishery output nationally) and inland fishery (0.3% of fishery output nationally). In Penang, the composition of fishery output is: capture fisheries (52.78%), aquaculture (47.17%) and inland fishery (0.04%) in 2017. The value of total fishery output of Penang was more than RM2 billion in 2017.<sup>2</sup>

There are currently around 5,000 fishermen in Penang (including full-time and part-time fishermen) and 500 aquaculturists.<sup>3</sup> The Department of Fishery (DOF) is planning to establish concentrated markets for local catches and high-value species. It is also working on a plan to increase fishery products to enhance food security, including through the setting up of the Permanent Food Production Park or Tanam Kekal Pengeluaran Makanan (TKPM) that aims to encourage secure food production in Penang.

In terms of the distribution of the various fishery activities, river estuaries and riverbanks around Penang and Kedah (Kuala Muda) are well known for high value fishery products. Pulau Kendi in Penang is a great location for artisanal fishing and is a rich breeding and feeding ground for fish. Sg Udang, Pulau Aman, and Pulau Jerejak are currently the main aquaculture areas.

Fish landing in Penang has declined gradually, while aquaculture output has increased steadily. The decline in fish catches is caused by a few factors, including intensive fishing, destruction of habitat, illegal fishing and possible impact of climate change. In 2017, Penang's aquaculture production grew by 51% and contributed to about 10.7% (RM815.2 million) of national aquaculture production.<sup>4</sup> The DOF has an Aquaculture Delivery and Service Support System or Sistem Penyampaian dan Khidmat Sokongan Akuakultur

---

<sup>2</sup> Department of Fisheries, Industri Akuakultur Di Negeri Pulau Pinang, 9<sup>th</sup> April 2019.

<sup>3</sup> Department of Fisheries, Industri Perikanan Di Negeri Pulau Pinang, 16<sup>th</sup> May 2019

<sup>4</sup> Department of Fisheries, Industri Akuakultur Di Negeri Pulau Pinang, 9<sup>th</sup> April 2019.

(SPEks) that provides support and services to aquaculture farmers, usually for those who are already established and have a good track record. However, most of the aquaculture output in Penang are of high value species destined for export, therefore contributing little to local food security at present.

Penang also benefits greatly from USM's Centre for Marine and Coastal Studies (CEMACS), which has made invaluable contributions to Penang's marine and coastal protection over the years. It not only carries out scientific studies of Penang's marine ecosystem but also helps to enhance commercial returns of Penang's marine resources through successful cultivation and green aquaculture. It has also identified a few potential areas to be established as marine parks in Penang, including the Middle Bank, Pulau Jerejak, Balik Pulau, Pulau Kendi and Kuala Muda.

Penang still has 1,045 hectare of mangrove forests, which are good breeding and feeding grounds for fish.<sup>5</sup> Mangrove forests are also high in biological diversity and great destinations for ecotourism. Furthermore, mangroves act as flood barriers, which are increasingly important in light of the future impact of climate change.

One of the greatest agents of change for Penang's coast and marine life comes from rapid land development and land reclamation. Land reclamation is not a negative process in and of itself but it depends on how well the developers and Government execute the project in terms of impact assessment, mitigating measures, compensation and so on. All land reclamation projects need to support the housing needs of Penangites and should not cater solely for rich foreign investors. Land reclamation projects must be held accountable to a set of safeguards and the Government should play an important role in setting up and enforcing the safeguards.

## 2. Main Challenges and Gaps

### 2.1 Fisheries

2.1.1 The Northern region of Malaysia, including Penang, is the main contributor of fishery produce, however, **fish landing in Penang is declining** from year to year due to depletion of fish stocks.<sup>6</sup> Apart from habitat loss near the coast (e.g. brackish water and mud flood), trawlers are destroying coral reef areas, and indiscriminate catches of fish coupled with bad fishing practices all contribute to the decreasing yield. The problem will continue to get worse if no action is taken to protect the fish and their habitat.

2.1.2 The health of fish stocks and marine habitat in the sea around Penang is affected not only by what happens in Penang, or its neighbouring state Kedah for that matter, but also what the neighbouring countries do (especially Indonesia). Without a regional understanding or agreement, Penang alone cannot protect its marine resources in the long term.

---

<sup>5</sup> Ministry of Natural Resources and Environment.

<sup>6</sup> Department of Fisheries, Industri Perikanan Di Negeri Pulau Pinang, 16<sup>th</sup> May 2019.



2.1.3 In Malaysia, cockles used to be a key income source for fishermen as they bring great profit, but now there is a huge shortage in number in Penang, so much so that farmers are facing a loss of around RM400,000 to RM 500,000 annually.<sup>7</sup> **Cockle production decreases** drastically due to an increase in water temperature and acidity.

2.1.4 Currently Penang does not have a detailed map showing the various sites with active fishing activities (fishing hot spots) and potential. As a result, fishing grounds are not protected from other forms of activities such as land reclamation.

## 2.2 Food Security and Safety

2.2.1 In terms of food security level, Malaysia ranks 2<sup>nd</sup> in Southeast Asia after Singapore.<sup>8</sup> However, certain types of food (such as poultry) have higher security level than the others. Due to the declining fish stock, Penang is now **increasingly relying on imported seafood** from other states and countries.

2.2.2 Over reliance on imported seafood puts Penang in a precarious situation. If and when there is a shortage of fish or seafood, import will be restricted by the exporting state or country, which will affect supply in Penang. The risk is especially real as climate change has an impact on marine life e.g. coral reef bleaching, changes in fish distribution and productivity of marine and freshwater species.

2.2.3 Reliance on imported fish and seafood also has other disadvantages. Apart from increasing our food miles, there is also the concern of the use of chemicals in growing the fish and seafood and prolonging their freshness, which may be detrimental to human health.

## 2.3 Aquaculture

2.3.1 Currently, businesses in aquaculture concentrate on producing high-value fish and seafood for export, with very little product going toward boosting food security locally.

2.3.2 **Regulatory framework for aquaculture is inadequate.** Firstly, there is no in-depth study on suitable aquaculture sites and the capacity of our seas to support aquaculture. The areas of aquaculture are not plotted properly in the Structure Plan. This results not only in aquaculture activities being carried out in suboptimal sites but also increased uncertainty for aquaculturists.

2.3.3 Currently only those products that are exported are subjected to more stringent production and environmental standards, these do not apply to aquaculture products for domestic consumption. Aquaculture, especially inland aquaculture, produces negative impacts on the environment that are not being properly regulated by the Government.

2.3.4 There is currently no biosecurity division within the DOF – a division that could help in controlling the spread or transfer of bacteria, viruses or other pathogens from one

---

<sup>7</sup> 2<sup>nd</sup> Marine and Coastal Management Working Group Meeting on 25<sup>th</sup> April 2019.

<sup>8</sup> "Malaysia's food security ranks No. 2 in South-East Asia", *The Star*, 26<sup>th</sup> July 2018.

<<https://www.thestar.com.my/news/nation/2018/07/26/malaysia-food-security-ranks-no2-in-south-east-asia>>

infected organism to another.

## **2.4 Data**

2.4.1 Holistic data collection is needed for the fishery sector as the current data is scattered. For example, there is no reliable data on fish species, fish landing, marine habitat loss, environmental impact of aquaculture etc.

## **2.5 Mangrove Ecosystem**

2.5.1 Mangrove forests in Penang are **currently not protected**. They are cleared for land development and aquaculture purposes. Without strong protection, mangroves are at risk of being replaced, which will negatively impact not only fishery but also migratory birds.

## **2.6 Development – Land Reclamation**

2.6.1 Land reclamation projects have huge impacts on Penang. The seawater in Penang flows around the island so land reclamation in one part will affect water flow in another. Very often the EIA only looks at a small area that is in the immediate vicinity of the proposed site, which does not capture the overall impact of the reclamation project.

2.6.2 Regarding the Penang Southern Reclamation project, the proposed mitigation action that is planting artificial reef balls in certain sea areas (e.g. Pulau Kendi) is not effective as Penang's seabed is muddy rather than sandy. The likely effect is that the reef balls will sink below the muddy surface. Land reclamation will affect marine diversity in Pulau Kendi (the only coral reef colony found off the coast of Penang), which subsequently will affect fish numbers in the area. As a habitat is destroyed in the reclamation site, migration of fish will quickly take place. The Southern Reclamation Project will negatively affect fish landing and catches in Penang.

2.6.3 The concerns and rights of fishermen are often not fully catered to even at the beginning of the land reclamation process. Compensation and safeguards are usually deemed inadequate, and the fishermen generally feel that their complaints are not heard. For example, interference from sea traffic during the land reclamation process and the safety of fishermen having to travel further out to fish may not have been factored into the compensation package.

2.6.4 Sand mining activities for land reclamation also destroys marine habitat and affects fishery.

## **2.7 Eco-Tourism**

2.7.1 There is currently a huge gap in the development of marine coastal eco-tourism in Penang. Apart from some water sports along Batu Ferringhi beaches, there is no plan to develop sustainable marine eco-tourism including kayaking, walking tours and other activities that can attract tourists. A site ready for interesting eco-tourism is the Middle Bank (sea grass) that would complement the cultural tours of the nearby George Town.

2.7.2 The cleanliness and attractiveness of Penang's beaches have declined in the last couple of decades. Water around the island is considered too dirty for sea bathing. This is a major concern for the ecotourism industry in Penang. There is not yet any plan to revive

and rehabilitate our beaches and coastal water.

2.7.3 There is considerable potential to develop Penang's mangrove forests into attractive eco- tourism destinations.

## **2.8 Fishermen Livelihood**

2.8.1 Generally, the fishermen community feels that their livelihood has been badly affected by rapid development of Penang's coast especially land reclamation, and the relevant authorities have not done enough to help them overcome the problems brought on by such development.

2.8.2 There is a lack of trust and cooperation between the fishermen community and the Government. The community feels that the relevant authorities have failed to explain the full implications of the Penang Southern Reclamation project on the environment and the effects on their livelihood (reduced fish stock) as well as their homes (increased flooding and pollution).

2.8.3 The compensation given by the Government is deemed insufficient compared to the permanent or substantial loss of income suffered by the fishermen as a result of land reclamation.

## **2.9 Marine Protected Areas and Biodiversity Conservation**

2.9.1 At the moment, there are no marine protected areas in Penang – there is only a marine corridor at Taman Negara, which acts as a protected area. Taman Negara lacks the capacity and manpower to look after it.

## **2.10 Governance**

2.10.1 There is limited capacity and authority to enforce the law on sea pollution. The relevant departments do not have enough boats and manpower to carry out frequent monitoring. Even when pollution is detected, it is not guaranteed that the source or culprit will be identified.

2.10.2 Proper marine and coastal zoning is currently insufficient. Given the unique environment of marine and coastal zones as well as their sensitivity and fragility, it is important that future development of these areas is well thought out so that long-term sustainability is not compromised for short-term gains.

## **2.11 Climate Change**

2.11.1 Given the long coastlines in Penang, it is imperative that Penang understands and is prepared for the impacts of climate change, which includes increase in sea-level, ocean acidification, coral bleaching and so on.

2.11.2 Some implications of climate change on Penang include:

- Lowland areas like Nibong Tebal, Parit Buntar, Bagan Serai will be affected by sea-level rise. If these areas are affected, Penang's main food security source

i.e. paddy fields will be greatly affected by the influx of saline water – our paddy plants are currently not saline tolerant varieties.

- Malaysia might lose 10% of the paddy production if the sea temperature increases by 1 degree Celsius.<sup>9</sup>
- Due to the increase in sea pH levels, shellfish like cockles in Penang's seas will be greatly affected, which in turn will affect the livelihood of fishermen and food security.
- Penang Mainland is projected to be highly impacted by sea-level rise in the future.

## 2.12 Awareness and Education

2.12.1 There is a lack of understanding among fishermen on employing sustainable fishing methods; There is also a lack of awareness and education among consumers about the types of fish they should buy.

## 2.13 Pollution

2.13.1 Sea pollution around Penang has worsened, leading to increases in E. coli and jellyfish. Pollution is carried around the island by water flow and tidal changes.

2.13.2 Fishing villages are badly polluted due to lack of cooperation between communities to look after their homes and livelihood.

2.13.3 Leachate problem from Pulau Burung (landfill) is causing pollution in places like Pulau Aman and Queensbay area.

3.13.4 Water quality in Seberang Perai Selatan is poor due to the development in the area.

## 3. Solutions

### 3.1 Fishery

3.1.1 **Fishery Impact Assessment** is required for any project related to coastal and sea development.

3.1.2 Establish a **Penang State Fishery Action Plan** that includes:

- Set out **short-, medium- and long-term goals** for the fishery sector in Penang, including assessing the demand for fish and requirement for food security.
- Identify **current and future fishing 'hotspots'** and establish safeguards to protect or replace them.
- Designate concentrated **wholesale and retail markets** for local fishermen

---

<sup>9</sup> Md. Mahmudul Alam et al., 'Impacts of Climatic Change on Paddy Production in Malaysia: Micro Study on IASA at North West Selangor', *Research Journal of Environmental and Earth Sciences*, Vol. 6(5), pp.251-258 2014, <[https://www.researchgate.net/publication/265785376\\_Impacts\\_of\\_Climatic\\_Changes\\_on\\_Paddy\\_Production\\_in\\_Malaysia\\_Micro\\_Study\\_on\\_IASA\\_at\\_North\\_West\\_Selangor](https://www.researchgate.net/publication/265785376_Impacts_of_Climatic_Changes_on_Paddy_Production_in_Malaysia_Micro_Study_on_IASA_at_North_West_Selangor)>.

to sell their produce.

- Carry out **future fish landing forecast**, taking into account the impact of dietary changes, climate change, land use changes (e.g. reclamation), and habitat destruction (e.g. brackish water, mangroves, coral reefs).

**3.1.3 Stricter zoning enforcement and patrol** to stop trawlers in undesignated areas and illegal fishing by non-Penang or international vessels. The DOF also needs to strengthen enforcement to ensure proper licensing of vessels.

**3.1.4 Public awareness and education programmes** should be promoted to encourage correct fishing practices and also **facilitate participation of women** in Small Scale Fisheries (SSF).

**3.1.5 Compensation** given by the state Government to fishermen should take into account not just their economic losses but also safety issues and inconvenience faced by the fishermen, and emotional loss.

**3.1.6** The State Government should urge the Federal Government to work out a **regional fishery solution** with neighbouring countries such as Indonesia and Thailand. The purpose of the regional discussion is to agree on an exploitation and protection scheme for fisheries in the Straits of Malacca to ensure the long-term viability of fisheries in the region.

## **3.2 Aquaculture**

**3.2.1** Government must set up a **comprehensive oversight and regulatory framework for all aquaculture** activities:

- Carry out **complete survey of coastal and marine environment** (including types of water, prevailing coastal and marine activities, surrounding ecosystem etc i.e. integrated coastal management approach) of the whole of Penang to identify the most suitable places for aquaculture.
- Identify the **capacity of the land and ocean** to support our aquaculture sector now and in the future.
- Conduct **feasibility studies** of areas suitable for sustainable aquaculture.
- Develop a **Best Aquaculture Practices Guideline / Standard** together with all stakeholders (DOF, Industry, NGO) that focuses on environmental well-being, social well-being and good management.

**3.2.2 Incentive/support scheme** – to increase aquaculture production for Penang's local food security as well as to promote sustainable techniques and practices:

- Actively promote **collaboration between private sector and academia** to identify species and production processes that are most suitable to Penang's natural and regulatory environment, e.g. profitable species that can cater to local needs as well as having export value, and also would not depreciate the natural environment.
- Health certification of aquaculture farms and produce should be made

mandatory for all aquaculture businesses, and not just those destined for export. **Stricter quality control** can also help open overseas opportunities and create a niche market for Penang's aquaculture.

- **Gazette the area once identified as a Zon Industri Akuakultur (ZIA).**
- **Implement a cluster system for the farm in the ZIA** for better cost and infrastructure sharing. This system will also enable an easier transfer of information and encourage best aquaculture practices among farmers.

### 3.3 Coastal Management

3.3.1 Penang needs an **Integrated Coastal Zone Management (ICZM) Plan** that binds and guides all coastal activities. It should also map out the details of usage, values and potential of coastal areas, which would subsequently be used to inform decision-making in land use planning. The ICZM Plan can build on past analysis and be established pretty quickly. All coastal activities need to then conform to the plan.

- **Concentrate future developments in selective and zoned unproductive fishing** areas, such as Queensbay, Georgetown, Straits of Malacca, and Sungai Acheh onwards. Active areas like Teluk Bahang, Kuala Muda, Balik Pulau area to Permatang area, Tanjong Tokong, Teluk Kumbar are rich in marine life and valuable fish, and should not be encroached on by development as this will cause a loss of biodiversity and fish migration.

3.3.2 **Land reclamation projects** must be executed according to the ICZM Plan / MSP and subjected to strict guidelines.

3.3.3 For every piece of **land taken from a sensitive area, another piece of land with corresponding value should be set aside for protection.**

3.3.4 Development should also **comply strictly with sustainable development** by including amenities like rainwater harvesting system, cycling tracks and so on.

- Development needs to **enhance and protect** existing natural assets and environment, instead of aiming just at reducing the negative impacts.

3.3.5 **Planning of interactive eco activities** that could attract tourists to places like Taman Negara would stabilize Penang's ecotourism standard and economy.

3.3.6 The on-going plan to **gazette mangrove areas as "Permanent Reserved Forest"** is important. Mangrove forests are very good breeding and feeding ground for brackish water organisms, many bird species and some land animals. This indicates that mangrove forests have a very high biodiversity value. Furthermore, mangroves are crucial for flood mitigation.

3.3.7 Introduce a **Resilience Strategy for Coastal Management**, where climate change impacts need to be better understood and rationalised in future coastal development to create a resilient ICZM:

- **Cost implication study** (projection of loss costs) on state Government and

local level projection.

- **Modelling** impacts of climate change on the local scale.
- Assess climate change impact on fishery.
- **New coastal engineering practices and preparedness.**
- Research into **saline tolerant crops** and farming.
- **Alternative food resources** from more tolerant habitats.
- Assessment of the severity of **soil erosion**.
- **Coastal pollution** study.

### 3.4 Marine Protection

3.4.1 The State Government should consider creating **Marine Spatial Planning (MSP)**, which is a public process of analysing and allocating spatial and temporal distribution of human activities in marine areas to achieve ecological, economic and social objectives that are usually specified through political process. MSP needs to be aligned with ICZM Plan.

3.4.2 Penang to have its own **Marine Protection Area** as a way to promote diversity in the marine ecosystem. This will indirectly and greatly compensate the tourism sector, thereby benefiting Penang's economy. For example, the Middle Bank can be a good candidate as a Marine Park as it has the best seagrass beds, which also happens to be the second largest in Peninsular Malaysia and would therefore serve as an ideal preservation and conservation area.

3.4.3 Penang state should consider setting up a **Department of State Park** that manages their own allocation of financial and personnel budgets, so as to not limit their work when it comes to handling serious issues. This may require some changes to the local acts.

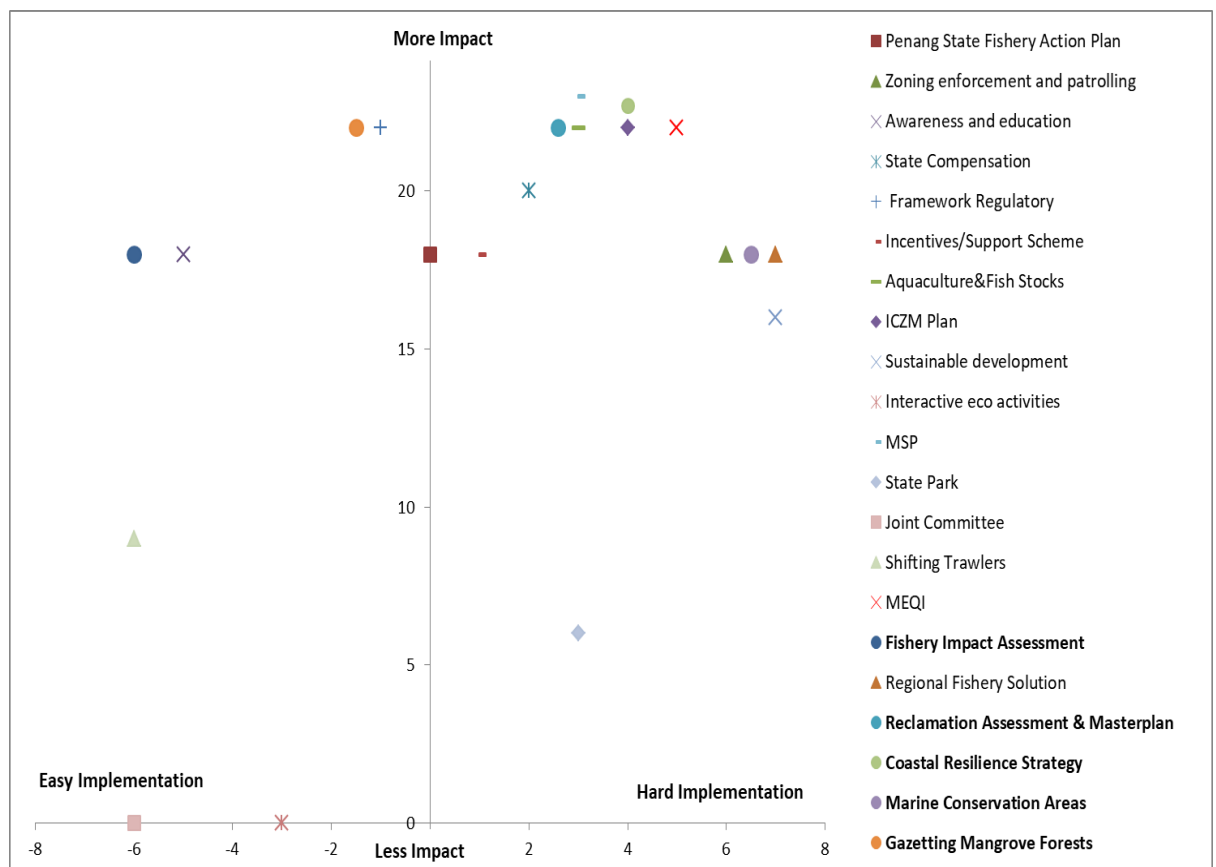
- It is better to gazette marine areas as state parks instead of national parks so that the state will have control over the park. Aside from that, the revenue from conservation fees imposed on visitors will go to state funds. The process to designate and gazette an area under the state is also much easier. Failing that, only then should it be designated as a national park.

3.4.4 The State Government should set up a **Joint Committee on marine protection** that oversees all aspects of marine use and health, including shipping, fishery, transportation, biodiversity protection, pollution etc.

3.4.5 **Trawlers will be shifted from Zone B to Zone C.** This is a solution to minimize damage to coral reefs, which act as natural breeding and feeding grounds for various marine organisms.

3.4.6 **Marine environment quality index** – Penang should take responsibility to monitor and improve the health of its marine environment such as water quality, marine species and habitat (biodiversity), pollution etc. There should be a health index designed accordingly.

## 4. Major Policy Recommendations and Milestones



### 1. Fishery Impact Assessment (2020)

In order to safeguard Penang's food security and protect our fishery resources, all marine and coastal development projects requiring Environmental Impact Assessment (EIA) should also be subjected to Fishery Impact Assessment. The Department of Environment (DOE) should include this as a mandatory requirement in the EIA. The purpose of the requirement is for project developers to present a realistic forecast regarding the impact of the development on fishery resources. Data collection should be thorough, to include field survey, and not solely dependent on Department of Fishery's (DOF) statistics. Apart from individual EIAs, the State Government should also take steps to make sure that the cumulative impact of Penang's coastal and marine development is captured in its Overall Fishery Impact Assessment, which should be carried out annually or bi-annually by the State Government. This can be included in a Penang State Fishery Action Plan.

### 2. Gazetting of Mangrove Forests (2020-2021)

Penang still has a few patches of mangrove forests, which are mainly concentrated in Barat Daya (BD), Seberang Perai Utara (SPU) and Seberang Perai Selatan (SPS) areas. Mangrove forests are home to a wide array of species and act as a natural buffer against erosion and extreme weather events. By preserving mangroves, Penang is not only protecting its food security but also its rich biodiversity. Currently, mangrove forests are under threat from development and aquaculture activities. It is recommended that the



State Government includes the gazettement of mangrove forests in the Structure Plan (RSNPP 2030), which is currently being finalised, before Local Plans are adopted. Gazettement can start at selected areas (e.g. SPU or Batu Maung). To further enhance the protection of mangroves, gazettement should also be accompanied by an additional layer of protection such as classifying mangrove forests as Category I to V under the IUCN Protected Areas, or as RAMSAR protection sites. This will make it more difficult for the de-gazettement of mangrove forests in the future.

### **3. Land Reclamation Assessment and Masterplan (2020)**

Given the ongoing and proposed land reclamation activities in Penang, it is imperative that Penang adopts a Masterplan for Land Reclamation as soon as possible. The purpose of the Masterplan is to identify: the geographical suitability of land reclamation in Penang, guidelines and standards that need to be adhered to, and future developments allowed on the land. Another urgent issue the State Government needs to address is assessing the cumulative impacts of land reclamation projects on Penang. Currently, land reclamation projects are assessed individually (with level of assessment dependent on the size of project) without taking into account the cumulative impacts of past, on-going and planned projects, including the impact of sand mining activities. The holistic assessment of reclamation projects should include an independent, comprehensive coastal hydrodynamic study to assess the cumulative impacts of present and future/planned projects. This can be assisted by requiring future developers of reclaimed land to install sensors in permanent stations to monitor water quality on a continuous basis. The results of the assessment should be reflected in both Structure Plan and Local Plans, and should be monitored consistently. In the long term, the Land Reclamation Masterplan and cumulative impact assessment can be incorporated into the Integrated Coastal Zone Management (ICZM) Plan as and when it is adopted by the State Government.

### **4. Marine Conservation Areas (2020-2023)**

Penang should propose to the Federal Government to establish Marine Conservation Areas (MCA) in Penang. This is in line with the National Biological Diversity Policy of Malaysia and it will allow sensitive and valuable sea areas surrounding Penang to be protected. Unlike Marine Protection Areas (MPA), MCAs allow small scale and local fishing activities to take place within the area. CEMACS has already identified potential areas for conservation and protection, including the Middle Bank (seagrass), Pulau Gazumbo and Pulau Kendi, among others. The Middle Bank is the second largest seagrass bed in Peninsular Malaysia and serves as a valuable conservation area. It is also situated at the narrowest point between the island and mainland. This means that any land reclamation happening is going to result in distribution of sediments around the island. Due to its proximity to the George Town World Heritage site, it can also be turned into an eco-tourism destination. On the other hand, Pulau Gazumbo covers a large and pristine area, with very little existing economic activities and human impacts, which makes it an ideal place for MCA. However, currently some of the shortlisted areas have been demarcated as land reclamation areas in the State Structure Plan (RSNPP) so the discrepancy needs to

be addressed. The State Government should also explore the possibility of establishing a sizable multi-use MCA instead of independent small MCAs, thereby enhancing connectivity and health of these areas.

The State Government should start the process of setting up MCA in Penang soon (2020) and to have at least one MCA established by 2023.

## **5. Coastal Resilience Strategy (2025)**

Given Penang's extensive coastlines, Penang State Government needs to understand the threat of climate change on its coasts and take precautionary steps to improve coastal resilience. It is an established fact that climate change is and will continually cause sea level rise globally, with Asia being impacted the most. It is therefore recommended that the Penang State Government should adopt a Coastal Resilience Strategy that sets out the long-term objectives and main components of coastal protection. The State and Local Governments can work with national and international organisations to better understand the impact of climate change at the local scale, including mapping of new coastlines following sea-level rise, and identifying the necessary measures to enhance resilience. Among the measures it needs to take are: exploring new coastal engineering practices, research into saline-tolerant crops and farming, growing alternative food sources from more tolerant habitat, and protecting the George Town Heritage Site. It also needs to look into the issues of soil erosion and marine pollution. Adaptation and resilience measures need to be incorporated into Local Plans. References can be made to the Coastal Enactment of JPBD (PLANMalaysia), the National Coastal Erosion Studies by JPS, as well as the Garis Panduan Perancangan Pantai introduced by the State of Perak.