

10 STUDY FINDINGS

The Penang State Government aims to undertake land reclamation activities for the creation of three man-made islands at the South Coast of Penang Island. SRS Consortium will be the Penang State Government's "Project Delivery Partner" (PDP) in ensuring smooth implementation of the entire project delivery success. The three man-made islands are intended to be developed as part of the expansion of Bayan Lepas Free Industrial Zone (FIZ) as well as for mixed development comprising of residential and commercial areas. The findings of this EIA are as follows.

10.1 Water Quality

The existing marine water quality around the Project area is considered as fair. However, the river water quality is already polluted from upstream activities as observed from the elevated nutrients and organics results. There is inadequate information on the sources of the pollutants so a detailed water quality study is required. There are eight rivers of Class III and Class IV based on DOE's Water Quality Index Classification (EQR, 2006) discharging into the water along the southern Penang coastline.

The presence of new landmass in the form of three reclaimed islands is anticipated to influence the flushing capacity of the waters surrounding the Project site. The potential impact of PSR development with regard to water quality (flushing) has been assessed using hydraulic modelling. Generally, good flushing capacity contributes to good water quality. The model results present that the flushing capacity is good with all retention time is less than 48 hours, but only if the existing water quality is pristine. Results at Sungai Bayan Lepas and Bayan Lepas Main Drain show that the modelled retention time exceeds 24 hours from the existing 2 hours while at Sungai Teluk Kumbar and Sungai Batu increased from 2 hours to 8 hours during neap period.

In alleviating the impact, Green River Programme is proposed. This programme entails the reduction of pollution load of pollutants sources contributing to the rivers. A comprehensive study needs to be conducted to quantify all relevant sources followed by suitable waste load allocations. Short-term and long-term with structural and non-structural measures are proposed under this programme. However, in the event that the Green River Programme is not practical, it is recommended to increase the width of the navigation channels between the reclaimed islands and foreshore of Penang Island.

10.2 Fishing Community and Fisheries

The general population in Penang Island south coast is 197,131 persons (2010 Census). For socio-economy, 250 respondents were surveyed which consists of fishermen, general public, business operators and beach users.

The overall assessment of the proposed Project from the population shows that a significant percentage (94.5%) of the fishermen were of the opinion that PSR would bring about more disadvantages than advantages whilst among the general public and business operators the assessment was more (74 and 84% respectively) for the advantages. Meanwhile, 57.1% of the beach users, being indirectly impacted, were of the opinion that it would bring more disadvantages than advantages. In general, slightly more than half (53.1%) were of the opinion that PSR would bring about more positive impacts as opposed to 46.9% saying that there would be more negative impacts.

Therefore, it is not surprising that there appears to be strong disagreement to the Project's implementation among the fishermen, while a strong agreement among the business operators and general public. The beach users are found to be equally strong for and against it. About 51.1% of the respondents agreed to the Project implementation, 46.9% disagreed and 2% not sure.

The fishing community in the study area is given special focus under the socio-economic study as there are many fishing villages found at the south coast of Penang Island. The fishing villages directly fronting the proposed reclaimed area fall under four Fishermen Unit areas of Permatang Tepi Laut, Sungai Batu, Teluk Kumbar and Gertak Sanggul. Fishing activities were conducted within the proposed Project site as well as within the surrounding sea. They support 805 registered and approximately 135 unregistered fishermen (LKIM, 2016).

A detailed assessment of fisheries and the fishing community was undertaken through discussions and interviews with fishing population at the study area. The fishermen were interviewed at fish landing points which are Sri Jerjak, Batu Maung, Teluk Tempoyak Kecil, Teluk Tempoyak Besar, Permatang Damar Laut, Permatang Tepi Laut, Sungai Batu, Teluk Kumbar, Gertak Sanggul and Pulau Betung.

Based on the interviews and discussions with fishermen, the most important fishing ground was within 3 nautical miles from the coast, with 66% of the fishermen attesting that they fished there regularly. Other major areas of fishing effort were Pulau Kendi and Pulau Rimau. Both these islands supported coral reefs, which accounted for the large aggregations of fish around them. While a minority of fishermen (1.6%) went eastwards to Padang Kota and west as far as Tanjung Bungah, the bulk of the fishermen (92.6%) fished within the boundaries.

The fishing industry is of fairly high value. The estimated gross incomes of the fishermen are based on values from the survey. The mean gross income per fisherman was RM1,989.50 per month ranging from RM500 to RM9,000 per month. The fishermen depends very much on fishing; though some supplement their income with other sources such as operating restaurants and boat rentals.

There are also quite a number of aquacultures at south Penang Island. Three aquaculture systems are employed in the study area which are marine cage culture, brackish water pond culture and oyster culture. In addition, shrimp/marine fish fry production (hatchery) is also actively undertaken.

The aquaculture industry brings in huge wholesale value with the hatcheries production forking in about RM8.8 million, marine cage culture with about RM60 million, brackish water pond culture with about RM19.6 million and oyster culture with about RM409,000.

Several locations in south Penang Island are used for recreational fishing activities. Two types of recreational fishing are undertaken which are shore-based angling and boat-based angling. Its total economic value is approximately RM5.3 million.

During the Project implementation stage, the Project area will be off-limits to the fishermen due to safety concerns. The marine capture is thus expected to be affected and can lead to overall decrease in fish landings. The reclamation will also cause permanent loss of a stretch of fishing grounds. The impact of the loss on the fishing economy especially is not easy to quantify. Fishermen will naturally seek out other grounds further out to sustain their catch. This leads to increased operational cost, particularly fuel, which in turn will affect their productivity. The reclamation footprint is located within the mudflat area. Collectively, the mudflat habitat is of great importance to large numbers of invertebrates and fish, providing nursery and feeding grounds to large numbers of fish species. Ten landing points were identified that are susceptible to impacts from the proposed Project implementation. Considerable increase in currents and wave heights may affect manoeuvring of the boats while sedimentation occurrences may cause the water depth to be shallow thus requiring maintenance dredging.

The Project Proponent shall give out *ex-gratia*/compensation to the fishermen for loss of fishing ground. The formula for compensation will be decided by the relevant authorities. There will also be allocation of affordable houses for eligible affected parties given by the Project Proponent. *Pusat Perkhidmatan Setempat Nelayan* (PPSN) is a centre for disseminating information and updates on PSR. Continuous engagements are conducted with the fishermen through PPSN. Job registrations for the public and fishing community at the PPSN are also currently on-going. New jetties shall also be constructed as well as prioritising provisions of scholarships for fishermen's children. Several offsets programme and mitigating measures will be conducted by the Project Proponent in efforts to replenish fish stock at strategic locations near the Project site which includes mangrove replanting programme and deployment of fish aggregating device (FAD). For recreational fishing, other recreational fishing staging areas are proposed to be located on PSR islands. Improvement on current staging area shall also be made.

Based on hydraulic modelling, there are no significant impacts on cage and pond cultures. However, the hatcheries are impacted as the water extraction points are lined along the coastline about less than 100 m away from shore. Dredging and reclamation activities will degrade the surrounding water quality, affecting the water extracted from the pipes.

The sediment plume generated during reclamation works will be contained using perimeter bund and silt curtain. Filtration system of the affected hatcheries shall be upgraded, based on feedback from consultation with the respective operators. If the TSS value in the waters exceeds 50 mg/L above ambient, the dredging or overflowing from the hopper barges shall be slowed down. For the intake points of hatcheries located within or very near to the reclamation footprint, the pipes shall be relocated to a more suitable area, based on feedback from the operators.

10.3 Corals

Corals are found at Pulau Kendi and Pulau Rimau. During the survey, the live coral cover in Pulau Kendi was <30% of the total coral area which indicates “fair” coral health. In addition, coral bleaching was also observed in Pulau Kendi. Meanwhile, the coral cover in Pulau Rimau is much lower with <5%. This indicates that the coral health is “poor”. Coral bleaching is also discovered at Pulau Rimau. The main disturbance on the corals comes in the form of siltation and sedimentation as well as increase in sea water temperature caused by current human activities (i.e. coastal development and overfishing).

The tolerance limit of the corals for TSS level depends on the species, grain size and geographic regions. It is envisaged that reclamation and dredging works conducted shall impact mostly on corals on the west side of Pulau Rimau as it is the nearest to Island A. Corals at Pulau Kendi has insignificant impact from the Project due to its ample distance. Therefore, considering the worst case scenario, the corals at Pulau Rimau are declared as a partial trade-off.

Nevertheless, several P2M2s are proposed which are to replace sand with small rocks for the construction of perimeter bund at the south eastern edge of Island A nearest to Pulau Rimau. A buffer of 500 m is also established from Pulau Rimau to the boundary of Island A. Offset programmes such as providing grant or financial support for coral related research and deployment of artificial reefs at Pulau Kendi and Pulau Rimau are proposed. Concerning the deployment of artificial reefs, a study must be conducted first to determine the reefs design and suitability of deployment area to ensure effectiveness of the programme.

10.4 Turtle Landing Area

There are five turtle landing areas discovered at the south coast of Penang Island. The area are at Teluk Tempoyak, Sungai Batu (Pantai Medan), Teluk Kumbar, Pasir Belanda and Gertak Sanggul. Female turtles usually produce eggs once every four or five years. They do not lay eggs on just any beach but migrate back to their beach of birth.

Therefore, once the PSR islands are reclaimed, there will be almost no way that the turtles can come back to the beach. However, the landings recorded are seen as rare occurrences at the south coast due to the rapid development along the beach. Even so, the turtle landing areas are considered as a trade-off.

Offset programmes are proposed which are to provide grant for turtle research or financial support to Turtle Conservation Centre at Pantai Kerachut (National Park) in Penang, Turtle and Marine Ecosystem Centre in Rantau Abang and SEATRU, Universiti Malaysia Terengganu.

10.5 Mudflat

Mudflat is a flat land with low-gradient which consists of fine materials (silt and clay). It is a habitat for many marine fauna and food for migratory birds. The loss of mudflat shall lead to the loss of benthic community. However, benthic can re-colonise elsewhere over time.

Mudflat along the coastline of south Penang Island shall be a trade-off once PSR is fully reclaimed. It will be a total loss within the Project’s footprint.

Proposed offset programmes include restoration of fish habitat elsewhere or protection of mudflat in other areas from future development. Other programmes are to provide grant of financial support for Fisheries Research Fund managed by Fisheries Department of LKIM. Mangrove replanting programme at suitable areas is also proposed to house marine habitat within the Project area. For the loss of benthic community within the mudflat, deployment of Fish Aggregating Device (FAD) is also proposed to replenish lost fish stock.

10.6 Other ESAs

There are no significant impacts identified for other ESAs such as aquaculture, recreational beaches and mangrove. Even so, it is proposed that offset programme in collaboration with the Forestry Department is conducted for mangrove; and beach enhancement or nourishment for the currently eroding beaches namely Pantai Tanjung Assam and Pantai Gertak Sanggul.

10.7 Economic Valuation of Environmental Impacts (EVEI)

The streams of discounted loss of environmental services over a period of 50 years that can be attributed to the proposed Project is calculated. The 8% rate is chosen to reflect the market rate of interest conventionally use for Project evaluation while 6% and 4% rates are more appropriate rates for social evaluation.

When discounted at the rate of 8%, the total present value of the stream of annual loss amounts to RM193.2 million over a period of 50 years. The corresponding values for 6 and 4% discounts rates are RM251.0 million and RM344.7 million respectively. This study notes that the sum should not be construed as indicating Project feasibility. Rather, they provide some indication of the magnitude, in monetary terms, of the reduction in the flow of environmental services as a result of the implementation of the Project over the evaluation period.

In view of the expected loss in the value of environmental services it is recommended that the Project Proponent initiates offsetting programmes to enhance some environmental services and pay *ex-gratia* or compensate eligible affected fishermen. At the same time, the Project Proponent can also offset the loss in environmental services from the mudflat and muddy seabed by engaging in the construction of artificial reefs or replanting of mangrove areas in some other areas that can at the very least partially compensate for the loss of services.

10.8 Conclusion

From the overall assessment, it can be concluded that the proposed development is expected to cause various degree of impacts on the environment, social as well as the surrounding land use. The State Government is advised to commit in implementing all mitigating measures proposed so that this development will be beneficial to both the local communities and the Penang State.