MSIA Reading Series 2

"Social Impacts of Coastal Zone Projects on the Fishing Communities"

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1. Introduction

The motivation of this Sembang Pagi Sabtu deliberation revolves around

i. General concerns on social impacts to the traditional/artisanal fishers (TAF) communities with increasing coastal development projects. Hence, the need to conduct the Social Impact Assessment (SIA) process

ii. In preparing the SIA, appropriate identification of zone of influence (ZOI) and fishery communities, as well as consideration of impacts of wastes and discharges from a proposed project in the coastal zone are essential

iii. The need to articulate that TAF are important communities who curate the national heritage and culture values. They should not only be regarded as providers of seafood that can be compensated for their income loss and resettled elsewhere

iv. Practicality in the planning framework by incorporating other impact assessments particularly the environmental impact assessment (EIA) into the SIA preparation, and the use of preliminary SIA process to support the creativity process of the value management (VM) of proposed coastal zone projects.

2. General Concerns of Social Impacts on the Traditional/Artisanal Fishers (TAF) Communities

Some of Malaysia's largest towns and cities are located on the coast such as Kuala Terengganu, Johor Bahru, Kota Kinabalu and Kuching. As the coastal towns and cities expand in tandem with socio-economic growth, creating more seafront spaces seems like a plausible solution. On the other hand, SIA professionals are becoming increasingly conscious at the scale and speed of such development. Studies have long revealed that 49% and 100% of demersal fish and shrimp fishery, respectively, are contributed by the coastal biological ecosystems (Macintosh 1982; Singh et al. 1994). To the traditional/artisanal fishers (TAF) communities, some coastal development can also mean destruction if not deployed sensibly. Therefore, how the welfare of TAF communities is, or should be, safeguarded by the Social Impact Assessment (SIA) processes becomes an increasingly important question.

Realizing the of the urgency to address the issue, in 2010, the Department of Town and Country Planning issued the pivotal National Coastal Zone Physical Plan (NPP-CZ) which called for "… *multiple values and synergies between the natural, physical and socioeconomic systems that interact in this dynamic environment, in order to ensure a productive, safe and biologically diverse coastal zone for the benefit of present and future generations*" (Hashim & Yahya 2011). The NPP-CZ clearly stressed that 1) terrestrial and marine biodiversity in the coastal zone, including species, habitats and ecosystems shall be conserved and sustainably managed, 2) the economic value of ecosystem services as well as the trade-offs associated with development shall be incorporated into planning and development decisions. The NPP-CZ 2010 stipulated that all structure plans, local plans and special area plans should adhere to its strategies. And for better clarity, in 2012 the department further published two supplementary volumes (JPBD 2012) that provided comprehensive maps and details of

biological ecosystems that are sensitive to development in peninsula Malaysia. These should be critically referred by planners and assessors when engaged to assist in coastal development projects. The National Physical Planning Council (NPPC) has recently approved the Second National Coastal Zone Physical Plan (NPP-CZ2) in October 2021 and the publication is expected to be issued in mid-2022.

In response to the NPP-CZ, in 2014 the Department of Fisheries Malaysia organized the "National Consultation on Ecosystem Approach to Fisheries Management" to recognize the ecosystem approach to fisheries management (EAFM) and resulted in the birth of National EAFM Framework. The National Plan of Action for the Management of Fishing Capacity in Malaysia was subsequently issued in 2015 to further strengthen the fishery community and sector holistically for underlining the importance of fisheries in the context of food security and national economy.

For effective deployment of SIA for TAF social safeguarding, firstly, a better understanding of the tropical coastal ecology that connects strongly with the social realities is needed. In Malaysia, TAF typically operate in Zone A (0–5 nautical miles from the coast; 1 nautical mile = 1.85 km) and the mosaic of coastal species habitats and ecosystems that exist in the zone and their fluvial interlinkages are complex and delicate. Changing or reshaping even one ecosystem can impact the entire chain of other ecosystems—for good, or for bad. Biological ecosystems of importance to the fishery sector can be categorized into:

1) estuaries
2) brackish rivers
3) delta wetlands
4) saltmarshes
5) mangroves
6) mudflats
7) seagrass meadows
8) coral reef

Secondly, the Social Impact Assessment Guideline Manual (2nd Edition) stipulates that social impacts are context dependent. To drive the assessment and mitigation actions, it is obligatory to understand the intent or purpose of a project for establishing a clear assessment scope and predicting the impacts to the TAF communities. In the context of coastal zone, the biological ecosystems can be negatively impacted by land reclamation and modification (>50 ha) possibly carried out, but not limited, by the following project purposes:

1) Drainage and irrigation
2) Construction or expansion of airport/airstrip
3) Construction or expansion of fishing harbours.
4) Construction or expansion of seaports and shipyards
5) Construction or expansion of power stations and oil refinery
5) Aquaculture projects accompanied by reclamation of mangroves
6) Conversion of mangroves for industrial, housing, agricultural or tourism use
7) Sand dredging
8) Hotels or Resorts

3. Zone of Influence (ZOI) and Fishery Communities

In highly developed coastal towns and cities where the seafronts are already devoid of biological ecosystems, on first glance, it appears that any further coastal modifications are not likely to compromise the aquatic habitats or fishing grounds because there is none to begin with. This is misleading as many observers fail to understand that coastal zone is essentially the fluvial interface between lands, wetlands, rivers and sea. What happens on a particular site in the coast can affect the hydrological characteristics of many biological ecosystems located nearby or faraway. Through fluvial connection, pollution from the site can also be transferred far and wide to the surrounding biological ecosystems and TAF villages by wave, current and tide; hence, impacting fishery and social vitality in the coast.

Generally, in Malaysia there are three forms of coastal modification or reclamation (creating new land on the coastline) namely the 1) linear, 2) peninsular, and 3) island. When the modification or reclamation is carried out in a large-scale (>50 ha) manner, the natural coastal hydrology (sometimes termed a hydraulic) may be distorted, hence impacting fishery habitats in adjacent and surrounding waters. Some areas will experience an increase of waves or flow velocity thus the fishery habitats may be flushed away. Most coastal wildlife species employ external fertilization of eggs and the process is greatly affected by hydrology; mating adults must be within 1 m of each other in slow or stagnant waters. When the flow velocity of their natural spawning grounds is increased, this results in serious problems for the reproductive processes as the female eggs are likely flushed away before being successfully fertilized by sperm from the male. On the other hand, siltation, sedimentation and sand brought in by disturbed hydrology will eventually degrade fishery habitats in areas, especially coral reef and seagrass meadows (Figure 1). Again, such unfavourable outcomes may occur in areas many kilometres away from the modification and reclamation site.

Figure 1. Seagrass meadow is an important nursery habitat of many fishery species. However, when the hydrological pattern is disturbed by a coastal modification project, the habitat can be rapidly degraded by changes in water turbidity, water-levels, flow velocity or undue siltation and sedimentation.

In social impact assessment, the Zone of Influence (ZOI) is typically defined by development site and impacted surrounding areas of possibly 100m, 500m, 1km or even up to 5km depending on project context. In the context of inland projects such as highway or quarry development, such an approach is a sensible approach for assessing impacts to be experienced by surrounding communities. It is however generally unsound for addressing coastal projects and the concerns of the TAF communities. The NPP-CZ itself considers 5km landwards and 3 nautical miles seawards of the intertidal zone as the plan area (Hashim & Yahya 2011). The NPP-CZ also recognizes the plan area may vary along different stretches of the coastal zone. As such, offshore natural island located beyond the 3 nautical miles should also be included into the structure plan, local plan and special area plan levels which govern coastal development. The approach of NPP-CZ makes sense because fishery habitats are ever-changing regions that are influenced by fluvial processes such as wave attenuation, sediment transport, hydrology, tidal fluctuations, freshwater-seawater transitions and even monsoonal flood pulses from inland drainages and rivers (Ng & Ong 2022).

For example, a mixture of very fine silts from tidal seawaters and alluvial soil from rivers is necessary to form the mudflats on where the mangroves grow and thrive. The mudflats are productive habitats of many types of seafood, most notably blood cockle (kerang; *Tegillarca granosa*) which is economically valuable to the TAF communities. To iterate, a modification carried out in any part of the coast or inland may change characteristics of fishing grounds in areas beyond the modification site and the ZOI convention. Therefore, for

predicting and critically identifying ZOI coverage (ie. communities affected), coastal bathymetric pattern and hydraulics acquired from spectral data of satellite missions can be applied (Figure 2). It is worth to note that the bathymetric pattern and hydraulics are changeable according to seasonal current and monsoonal influences in the case of Malaysia. Therefore, spatial and temporal analysis of monthly spectral data is useful to inform ZOI establishment.

Figure 2. An example of rendering from spectral data acquired in 25 Aug 2021 by the Landsat 8-9 satellite missions over coastal Perak. Spectral data is highly effective for rapidly identifying coastal bathymetric patterns and hydraulics to inform planning processes. The fluid appearance of bathymetric pattern observed herein reinforces the notion that the ZOI of a coastal project cannot be rigid like an inland project

As mentioned earlier, even inland developments may affect the coastal biological ecosystems. For instance, a new development of a dam in a river a few hundred kilometres inland is expected to reduce volumetric water and sediment outflow to the delta and coastal zones. Such lowering of hydrological pressure from the inland river will shift the brackish zone—where fresh water meets seawater—further upriver. The brackish zone of rivers is an important habitat of many economic species, especially giant freshwater prawn (udang galah; *Macrobrachium rosenbergii*) because their spawning and larval stages can only be completed in brackish water. TAF communities who live in the brackish areas for generations will abruptly experience loss of harvest or encounter different types of fish in their traditional fishing grounds which they may not have the skills or tools to harvest. Likewise, communities who are used to harvesting freshwater river fish may be impacted when the species population is drastically reduced by seawater intrusion. The intrusion would also likely affect inland crops and farming communities when the irrigation canals and underground waters are tainted with high salinity. With less sedimentation transport from inland, the delta and mangrove habitats may shrink, thus further degrading the fishery habitats in the coasts.

To be context driven, the SIA process and ZOI establishment should also consider impacts of wastes and discharges from a proposed project in the coastal zone. These can be transported fluvially to the TAF villages and fishery grounds. Energy demand in populated coastal cities is often met by coal-fired power plants and such projects illustrate the issue aptly. A coal-fired power plant is typically built on coastal reclamation because its power generation process and cooling system need large amounts of water from the sea to operate. The Union of Concerned Scientists has highlighted that the warm water discharge (>32 ◦C; usually termed as thermal pollution) by power plants and chemicals applied to sanitize cooling systems into coastal waters as dire concerns that threaten the coastal biological ecosystems (Averyt et al. 2011) Water pollution, impingement of marine organisms, elevated sea surface temperature (SST) and reduced water pH have been detected in surrounding waters of coal-fired power plants in Malaysia (Azila & Chong 2010; Chong et al. 2015). Similarly, a coastal reclamation for residential, commercial, industrial or tourism application in the can also affect fishery habitats many kilometres away with pollutants when transported by waves and sea currents. Again, this exemplifies the critical need to analyse the local coastal bathymetric pattern and hydraulics when attempting to outline the ZOIs.

4. SIA and Fishery communities

We know for certain that the TAF communities are crucial for contributing to the nation's food security. They will be negatively impacted in terms of liveability, income loss and displacement if the coastal projects are poorly planned and executed. These go without saying and the impacts are already widely documented in SIA reports and literature. But what is often not articulated is, they are important communities who curate our heritage and culture; thus, valuing them only as providers of seafood that can be compensated for their income loss and resettled elsewhere is somewhat short sighted.

In all Malaysian states, the most advanced societies first began in the coast many centuries ago and expanded landwards subsequently. We only have to analyse the histories of Kuala Terengganu, Malacca, Perak, Sarawak or Sabah to know this is a fact. This is likely due to the productivity of coastal ecosystems which resulted in the abundance of seafood that can be harvested freely and easily in the coast. The favourable biological circumstances have also given rise to heritage and many cultural practices we appreciate today. For example, TAF communities are highly skilled in producing batik textiles using a traditional method with beewax and cutch (a natural dye made from the *Rhizophora mucronata* and *Ceriops tagal* tree bark) collected from the mangroves. Traditional batik production is now recognized as a Masterpiece of Oral and Intangible Heritage of Humanity by UNESCO. Harvested sustainably, the biological ecosystems provide timber, charcoal and rattan for traditional boat-building, house-building and craftworks. Sap extracted from the inflorescence of the Nipah palm (locally known as *nira*) in the coast is traditionally processed into sugar and vinegar by the coastal communities. Additionally, various parts of mangroves and coastal plant species have been applied by the TAF communities as traditional medicine to cure or manage a wide range of ailments. It is clear that any degradation or threat to the coastal biological ecosystems will have a profound negative impact on Malaysia's heritage, cultural values, medicinal and other best practices developed progressively for centuries by the TAF communities.

The identity of the TAF communities is essential linked to the biological ecosystems to sustain Malaysia's heritage and cultural values in the coastlines. Therefore, in the process of SIA, explicitly the "Impact on Sociocultural & Heritage" aspect in the Social Impact Scoping Matrix should be carefully assessed and documented (Figure 3). Currently many SIA reports are only focusing on physical venues such cemeteries, historical sites and places of worship for this aspect. It is strongly suggested that biological venues critical for maintaining sociocultural and heritage values of the communities should also be given enough attention. The national heritage and cultural characteristics will fade a little every time we lose a TAF community.

Figure 3 Engagement session with fishermen group from Orang Asli Community is one of the important process in order to understand the current issues and challenges in the future due to coastal development

5. Synergy of Collaborative Assessment

At this point, it is somewhat apt to ask—isn't the EIA process supposed to identify and mitigate the fishery habitat degradation problem? The answer is likely a resounding "yes" because environmental and ecological experts are certainly in a better position to identify sensitive coastal ecosystems. Nonetheless, ideally, a concerted alliance between environment and social sciences should be embraced to produce the best overall results. All fishery spawning and harvesting grounds should be identified by the EIA as the process has a duty to safeguard species and ecological integrity of areas in the projects' surroundings. Subject to hydrology analysis, fishery habitat regions occurring further away should also be identified in line with the precautionary principle.

As the methodical adage goes "you can't manage what you don't measure". While this is obvious, how the measurables can be integrated and usefully applied is still not commonly attempted. In the context of trying to mitigate the fishery impacts, it is suggested that the variety of biological harvests (eg. fish species, crustaceans, molluscs etc) by the TAF communities should be itemized and quantified to serve as the pre-development baseline for EIA monitoring. Subsequently, it is advisable that the EIA baseline be used by the SIA process to infer the relevant socio-economic baselines. Types and quantity of species harvested monthly and their market prices can be used to predict the possible socio-economic

loss if the fishery grounds become unproductive (usually termed scientifically as the "loss of ecosystem services") in post-development scenarios.

In some coastal zones like Nibong Tebal, Cherating, Kuala Selangor, Bako and Klias, ecotourism boat tours operated by TAF communities are important rural economic activities. The tours awe tourists with interesting sightings of birds, fireflies and proboscis monkeys in the mangroves and river delta areas. Therefore, such aerial and terrestrial species should also be assessed collaboratively by the EIA and SIA processes because any degradation of their habitats will substantially reduce TAF livelihood and this should be highlighted in the Social Impact Scoping Matrix. The GIS data of important coastal, brackish and possibly inland rivers and wetland generated by the EIA process should be applied to generate the appropriate ZOI for the SIA process. TAF communities residing in areas further away from the development site may also need to be included in the ZOI depending on hydrology patterns and inter-linkages of the local biological ecosystems as highlighted earlier (Figure 4).

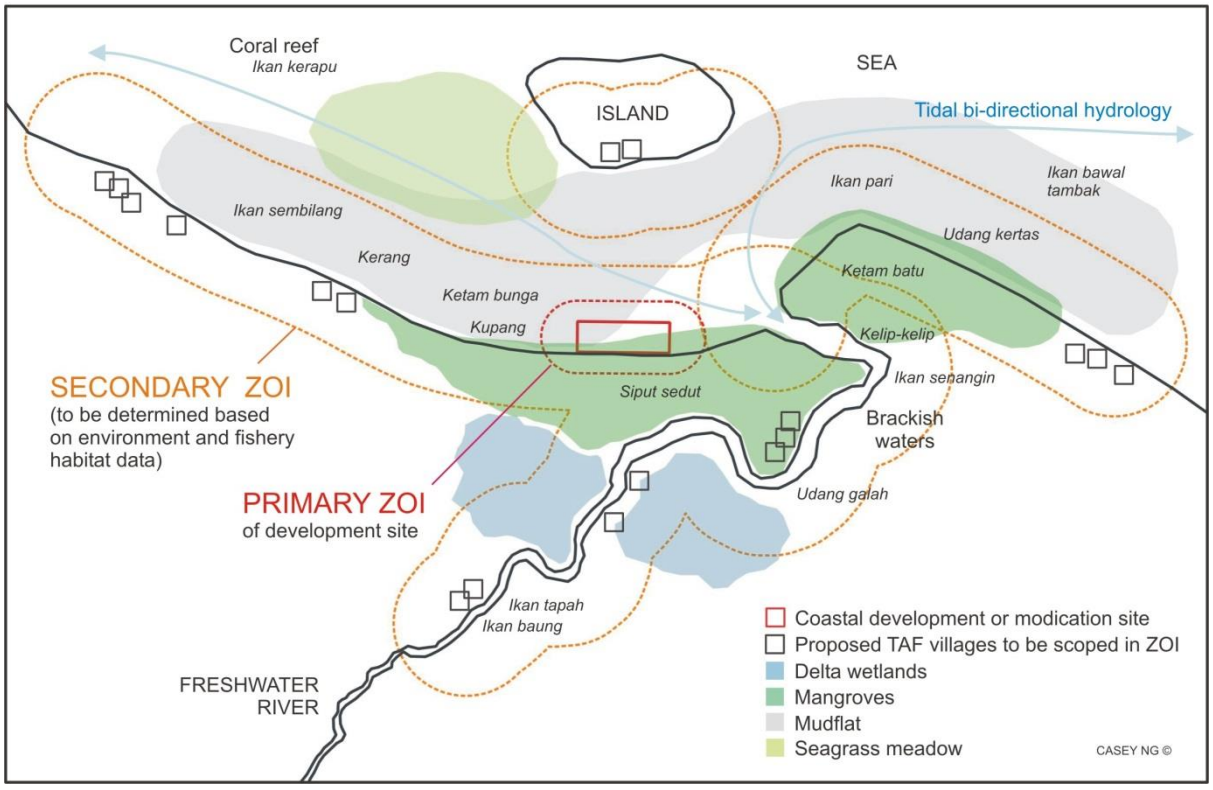

Figure 4. A hypothetical example of ZOI delineation that considers hydrological linkage of the fishery species habitats marked with Malay vernacular names in *italics*). Hydrological flow in a tidal area is bi-directional; thus, influences from the development site can be affect fishery harvests of the TAF communities residing in the coastline, island as well as inland through the rivers.

6. Power of Preliminary SIA

So, what is next after the ZOI assessments are done and the impacts and losses are identified? Typically, TAF community resettlement and compensation will ensue. But are these the only options? Could we not envision or assist the coastal developers consider other community-friendly, offsetting or restorative options in their masterplans? Practically, attempting to improve a project master plan after an SIA process by addition and adjustment is costly and time consuming from the perspective of project proponents. "Going back to the drawing board" requires more re-surveying, engineering modification, cost recalculations and a series of meetings which will substantially delay the project implementation. More often than not the SIA findings, approval processes and negotiations to produce mitigation proposals may be attributed for delaying the projects, and SIA professionals may end up experiencing the backlashes.

Such predicaments can be avoided in the first place if the project proponents engage planning and SIA professionals who are well-versed with the local intricacies and have the interest to make lives better for the local communities. Correspondingly, if the project proponents also engage engineers who diligently practice the Value Analysis (VA) and Value Engineering (VE) processes, or collectively known as Value Management (VM), during the planning process, the masterplan designs would have more finesse and sensitivity to the environment and social aspects (Figure 5). It is worth to note that the Lembaga Lebuhraya Malaysia (LLM) has recently published a beneficial "Garis Panduan Pelaksanaan Pengurusan Nilai (Value Management) Bagi Projek Lebuhraya Penswastaan" (LLM/GP/T11-21) where the preliminary SIA processes are supposed to rigourously assist the planners and engineers search for the most community-friendly options during the planning stage.

The guideline requires all professionals involved in the planning process to practice 1) information gathering; 2) function analysis; 3) creativity; 4) evaluation; 5) development; and 6) recommendation. Numerous options and further improvements are recommended through the creativity process and the best option is to be chosen collectively through open discussions in a series of workshops. It would be sensible that a similar guideline should be provided for coastal development. This ensures major negative impacts would have been robustly analysed, discussed and ironed out before the establishment of master plans. Subsequently, there would be minimum resistance from the communities when the established masterplans are applied to drive the full-scale SIA and EIA are carried out.

Figure 5. An example of coastal road development that disturbed the natural intertidal hydrology and caused mangroves to die-off. Such a problem would have been easily resolved if the road was engineered with more culverts that enable free flowing of tidal waters.

To illustrate the potential, if an off-shore island is to be created by reclamation, data and expert opinions consolidated in the preliminary SIA process will be valuable to support the creativity process of the VM. With some innovations, the VM process can result in shallow areas to be planned and designed for mangroves or seagrass restoration which enriches fishery habitats for the TAF communities. Hence, the project stands to make the site better instead of degrading the site. This will substantially add value to the masterplan or act as an offset initiative to fishery grounds predicted to be impaired. Additionally, the new island could also be designed to host the TAF villages and jetties thus improving living conditions and offer new socio-economic opportunities. Coupling the preliminary SIA with the VM process is a powerful catalyst for reducing social unrest if practiced effectively.

Social impact mitigation cannot be an after-thought process. The preliminary SIA should be the earliest meeting point to minimize social tension prior to the full-scale SIA process. The meeting point should also focus on proposing and ingraining beneficial elements into the master plan, in line the aspirations of the latest National Fourth National Physical Plan (NPP-4) which calls for all projects to be aligned to the United Nations' Sustainable Development Goals (SDG). In the context of SDG, initiatives to improve the coastal ecosystem and TAF livelihood support the aspirations of SDG10 Reduce Inequalities, SDG14 Life Below Water and SDG15 Life on Land. When master planners and project proponents ignore communal linkage to biological ecosystems, often under the guise that a project is of "state" or "national importance", the results may lack broad social legitimacy and justification.

The ideal master planning exercise would require open-minded engagements with the local communities with at least two overarching questions: 1) what do the locals need/want from the project? and 2) how can everyone get there, collaboratively? (Figure 6). When projects keep taking and giving nothing back to the local communities, red flags are raised and

repercussions that follow usually delay or obstruct the projects. A masterplan that adds value to the local communities (who have *locus standi*) is seldom rejected.

Figure 6. Collaboration with the TAF communities to collect baseline data is a favourable approach to ensure transparency that gains local support. Local fishers often have better knowledge of the local spatial and temporal characteristics and they are valuable partners to assist in the master planning process

7. Sustainable Development is Being Sensitive to Marginalized Communities

Adherence to the strategies and guidance NPP-4 and UN-SDG is fundamental prerequisite of modern-day sustainable development philosophy. Consequently, interdependence between people and the biological ecosystems need to be respected. And this is where we, as social stewards, can play our part since we are better informed than most other professionals about the fate of the TAF communities. New bold approaches and thinking by planners, architects, engineers and certainly SIA professionals are required to safeguard the biological ecosystems, and their functions, specifically recognizing the scale of societal values dependent upon them. If a coastal development project is carefully engineered and planned to benefit all communities who live around it, undoubtedly, the social and environmental aspects will be minimally impacted. However, when project proponents continue to hatch ill-designed master plans and accept that resettlement and compensation are the price to pay for coastal development, the TAF communities will someday go extinct along with the cultural and heritage values curated by them over the centuries.

8. Conclusion

The Sembang Pagi Sabtu deliberation is centred around the social impacts of rapid coastal development on the traditional/artisanal fishers (TAF) communities. The SIA process is warranted to ensure the communities are not inevitably marginalized by the rapid socio-economic growth in the coastal areas. The SIA process should identify the appropriate ZOI that considers *in-situ* and *ex-situ* cumulative impacts of the proposed project. Critical sensitivity should also be focused on the TAF communities' inherent connections to their surrounding biological ecosystems to enrich their livelihood, culture and heritage. Therefore, compensation and resettlement should no longer be the acceptable forms of mitigation because the cultural and heritage values curated by the communities will be impaired or lost if they are shifted elsewhere. For better outcomes, the SIA process should incorporate the findings of other impact assessments, particularly the EIA, to support the management and implementation of mitigation measures which concern the TAF communities.

Lessons learned from this Sembang Pagi Sabtu deliberations and as takeaways for the participants are:

i. Social impact mitigation should not be an "after thought" process. The preliminary SIA process should be deployed at the earliest stage to fully understand the plight of the TAF communities and to minimise social tension prior to the full scale SIA process

ii. Collaboration and continuous engagements with the TAF communities to collect baseline data and invite inputs is key for ensuring transparency that gains local support

iii. Social impact assessors should play the most critical role as "voices" of the TAF communities since the assessors are better informed than other professionals about the fate of the fishing communities should ill-designed coastal projects be permitted

iv. New bold approaches and sustainable development practices should be adopted by planners, architects, engineers and certainly SIA professionals to safeguard the coastal biological ecosystems which is vital to the TAF communities

v. Compensation and resettlement are not always the sensible answers to the woes and plight of the TAF communities as their livelihood, culture and heritage cannot function without their native environments

vi. The TAF communities may become extinct, along their unique culture and heritage that are highly valuable to Malaysia, if their concerns and welfare continue to be sidelined.

Acknowledgement

The contributions and deliberations of the panelists during the Sembang Pagi Sabtu session are very much appreciated.

Disclaimer

In the spirit of inclusivity and transparency MSIA is open and frequently invites experts of various fields and stakeholders to share their perspectives on how the SIA processes can be more efficacious. Any views and assumptions expressed however are solely those of the authors and do not necessarily reflect those of MSIA.

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