Technology Fact Sheet

Reclamation Technology[i]

1) Introduction

Most of big cities in Indonesia are located in coastal areas, having large populations and rapid growth economic activities. Often, available land is not able to support growth and development of the city, i.e. level of need and growth of such settlements, industrial sites, offices and shopping centers and tourisms.

In order to obtain the needed lands, the big cities see the area that had been forgotten, i.e. the coast (coastal zone), which generally has a low environmental quality. This phenomenon is not only experienced by Indonesia, but also experienced by developed countries, so that the coastal area will be a concern and a beacon of hope in solving the supply of urban residential population.

Considering these conditions, reclamation activities is one of the activities which are unavoidable at this point. Reclamation can provide both positive and negative effects for society and the coastal and marine ecosystems. The positive impact of reclamation activities include the improvement of quality and economic value of coastal areas, reducing the land that is considered less productive, the addition of territory, protection of coastal erosion, improvement of aquatic habitat, improved hydraulic regime of coastal areas, absorbing employment. etc.

While the negative impact of the reclamation activities on the environment include physical effects such as changes in hydro-oceanographic, coastal erosion, sedimentation, increased turbidity, marine pollution, changes in groundwater regime, increasing the potential for flooding and inundation in coastal areas. Induced biological effects such as disruption of mangrove ecosystems, coral reefs and sea-grass beds and the decline in biodiversity, as well as some social impacts such as community activities in the region is largely coastal fish farmers, fishermen and laborers, so that the reclamation will affect the catch and impact on decline in their income.

In carrying out reclamation, it should follow the procedures and guidelines have been prepared by several institutions like the local government, so as to minimize any negative impact. Currently, the site that has been developed into the reclamation area includes Losari beach in Makassar, the beach of Semarang and part of Jakarta bay area.

2) Technical Requirements

In the implementation of the reclamation work, the things to note are:

1. Study of the impact of reclamation, such as:
    - Changes in the coastal hydrodynamic as a result of changes on flow and wave patterns during reclamation construction which will cause turbidity of waters.
    - Changes in the sediment transport that occurs due to the disruption of littoral transport which lead to erosion on one side and sedimentation on the other.

- Changes in the ground water that occurs when the accumulation of wet material reclaimed from the sea, the sea water is trapped and will contaminate the coastal ground water aquifers.
- Changes in the water system in the hinterland resulting from the reclamation. The disturbance is lengthening the water drainage path or decreasing the existing gradients of water flow hydraulic that can reduce drainage capacity. This condition is vulnerable to flood.

2. In the muddy areas, attentions should be made on:

    - Mud wave or explosion that is an area that has a low carrying capacity because its type of soil is mud.
    - Lowering the non-flat surface land resulting from the uneven mud thickness.

    - Liquefaction; it is a sandy soil that lost its carrying capacity due to imperfect compaction, so that when vibration/shock take place such as that caused by the earthquake, the reclamation land can be buried. Liquefaction is a process of reducing drastically ground pressure on soft sand with uniform particle size which is soaked water, due to instantaneous load (e.g. an earthquake or vibration). The instantaneous load causes increasing water pressure in the soil pores, so that effective soil pressure will be dropped (if it reaches zero, the grains will float). This will decrease soil bearing capacity and makes it could no longer able to support the load on it.

    - Parameters that influence the occurrence of liquefaction process are: the type of land and sand particle size distribution (fine sand, medium and uniform), low density particle (not solid), environmental conditions (submerge in water), shocked load (seismic / vibration).

3) Status of the technology and its future market potential

Reclamation provides many advantages to developing some regions. This practice gives alternative land selection for expansion of areas, the arrangement of the coast, creating alternative activities and the development of marine tourism. The reclamation of an island can withstand tidal waves that erode beaches. Instead, they can also become a sort of dam to hold the intrusion and land floods. But keep in mind also that reclamation is also as human intervention on nature and all of these activities may also bring adverse effects.

In order to minimize the adverse impact, it needs a deep assessment of the reclamation project by involving many parties with interdisciplinary science and technology support. A careful and comprehensive study of the reclamation will certainly result in an reclamation area which is secure and environmentally preserved.

Coastal areas reclamation and revitalization projects developed by the local government of Jakarta is intended to build and provide those areas to be a business and economic activity as well as elite settlements. With this initiative, the government of Jakarta and their several corporate partners intend to change the title of Jakarta to be a Water Front City.

4) Contribution of the technology to protection of the environment

Healthy ecological and ecosystem conditions will ensure the sustainability of economic activities. For that reason, reclamation activities must be planned with as much as avoiding possible problems.

- Disturbance to the presence endemic and protected aquatic biota (endangered species).
- Significant reduction of the diversity, abundance and biomass of benthic organisms due to an increase in suspended solids.
- Damaged and the loss of plants that became a place to live for aquatic biota.
- Changes in animal migration patterns, the death of biota, the extinction of biota, disruption in the form of expulsion and noise to wildlife.
- Damage to the function of the protected habitat/ecosystem (mangroves, coral reefs, sea-grass beds, wetlands) located in the coastal waters and estuaries.
- Disturbance to the protected areas, so it should be considered whether the region should be preserved, revitalized or diverted its designation.

5) Climate

Reclamation development does not directly reduce the impact of global warming, population adaptation technology through land reclamation will improve people quality of life and of course on improving the quality and economic value of coastal region. Instead reclamation will bring benefits it can also lead to various negative impacts on social and environmental areas. Therefore, prior to reclamation activities, it absolutely needs extensive support for the study of various aspects, such as socio-cultural, economic, environmental, technical, transportation and so forth. Reclamation plan should be included in the spatial planning document having the force of a strong legal binding (Local Government Regulation, Presidential Regulation or Government regulation).

6) Financial requirements and costs

In 2012 for example, the budget allocated for reclamation of Painan area is about Rp 300 billion. As for reclamation in the outer islands of Pulau Nipah only implemented for the purposes of economy, defense and security. Likewise, the beach called on Losari, Makassar in the Center of Indonesia, with amount of fund as much as Rp 19 billion for the construction of the embankment. The total budget needed for reclamation of Losari reachs of about Rp 500 billion and the land will be used for businesses, country palace, public and green open spaces. Losari beach reclamation will be provided to invest.

---

[i] **This fact sheet has been extracted from TNA Report - Adaption for Indonesia. You can access the complete report from the TNA project website http://tech-action.org/**