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CASE STUDY ON LAND RECLAMATION USED WORLDWIDE

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Abstract **–** This review paper proposes Land reclamation which is the idea or artificial method to increase the land area of a country for infrastructure purposes. It is done in oceans lakes, and coastal areas to enhance human resources. Land reclamation is the process of creating new land from the sea. Usually, there is a natural process that fills such areas with sand, dirt, and other materials. Land reclamation uses the same method of landfilling, which is speeding up. This paper reviews some case studies on land reclaimed worldwide.

Most of the world's docks now fill spaces that were once water, and this has influenced the coastal landscape heavily. Japan has been one of the countries most in need of expanding into the sea90 percent of Tokyo Bays coastline is reclaimed land, which is almost 250 square kilometers of new land. In the 21st century, this disproportionate conquest of the land is no longer acceptable. Therefore, artificial islands have been built indiscriminately in the Persian Gulf for residential purposes. Some have encountered issues, for example, "The Palms" in Dubai and "The World" in Dubai, which are affected by waves and currents.

Keywords **–** Land reclamation, landfilling, Artificial Island, coastal areas.

I. INTRODUCTION

The process of upgrading lands to make them fit for more intense usage is known as land reclamation. Irrigation to restore rain-depleted areas, the removal of hazardous materials from salty or alkali plains, and other reclamation efforts are all options. tidal marsh diking and draining, strip-mine spoil areas smoothing and revegetation, and related operations. Land reclamation is a unique technological method for preserving good land conditions, a valuable natural resource for agriculture. Land reclamation entails a significant transformation of the land as a consequence of a series of actions. Land clearance activities (brushwood removal, leveling of molehills, etc.) are the most prevalent kind of land reclamation. Chemical reclamation, silvicultural reclamation, loose sand stabilization, water and wind erosion management, and so on. Land reclamation aids in the preservation and enhancement of soil fertility, the expansion of crop capacity, the development of agricultural sustainability, and the reduction of the impact of climate and weather variability on production capacity. Although the extent of land reclamation is growing, the present focus is on improving its efficiency. The goal of reclamation of areas with poor physical qualities is to improve the aeration, porosity, and permeability of the soil. To achieve this, effective crop rotation is implemented, sand is applied to muddy soil, and mole drainage is carried out, all of which help to increase air and water permeability in deep soil layers.

The removal of harmful salts by leaching, the lowering of soil acidity by applying lime, the raising of soil nutrient-supplying power by distributing fertilizers, and the introduction of proper crop rotation with a higher ratio of grass are all part of the reclamation of lands with adverse chemical properties. Reclamation of sites prone to water and wind erosion often includes taking steps to reduce the quantity and rate of surface water runoff, as well as increasing soil resistivity to erosion and dispersion. These measures rely on a variety of reforestation, agrotechnical, and hydro-technical techniques. Currently, in the majority of the places undergoing reclamation work, not one, but multiple of the above-mentioned reclamation types are carried out in response to a combination of natural and economic factors. Forest belts are planted, agricultural rotation is implemented on irrigated fields, fertilizers are applied, and salty land plots are leached, among other things, all while the

region is irrigated. All of this combines to make land reclamation one of the most significant anthropogenic processes in the modification of nature in general and the hydrological regime in particular in our nation.

The following are three mainland reclamation objectives:

1. Improvement of lands that are subject to unfavorable water regime circumstances manifested in either excess moisture or a lack of it as compared to the quantity judged enough for optimal economic usage of the region.

2. Improvement of lands with poor physical and chemical soil qualities (heavy clay and muddy soils, saline, acidic soils, and so on).

3. Improvement of areas that are vulnerable to harmful physical impacts, such as water and wind erosion, which results in the formation of ravines, landslides, and soil scattering, among other things.

II. Methodology:

Depending upon various aspects such as land type, landfill type, soil foundation and topography, different methods can be opted for the process of land reclamation.

1. Dry Method

It is one of the simplest method of land reclamation in which the land is filled with rocks, boulders and cement.

Although, this method can be dangerous when in case of seismic activity asthis method usually results in filling of loose profile, and so it is required for reclaimed land to be more dense.

2. Hydraulic Reclamation Method

It is a wet method in which the fill material is obtained from an offshore borrow source and it is only suitable for soil granular in size which has good drainage characteristics.

3. Rehandling Method

In this method, barges are used to transport and dump fill material in a temporary storage pit that can have a capacity of a several million cubic metres. For rehandling pit the location is usually selected at a natural depression or created by dredging.

4. Hydraulic Filling Method

This type of method is opted for when filling is carried out from an offshore source.

The fill material is taken from the borrowed source and then sprayed though a discharged pipe to the desired location but this method is not efficient when the seabed is too shallow or too soft.

5. Sand Spreading Method

This type of method is used where Hydraulic Filling method cannot be opted i.e. where seabed is too shallow or soft.

In this, the sand is discharged through pipes along with water with the help of a spreader. Winch system is opted by the spreader and also a bulldozer that helps to move from one area to another. Methodology

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III.CASE STUDIES:

Nice Airport, Europe

• It plays an important role in facilitating economic process, particularly in developing countries.
• Another need for Airport comes into play as 40% of international tourists now surpass air.
• Aviation helps to extend the occupancy rates of 65 to 70% – which is quite double those of road and rail transportation.

About Construction –

• The runways of the airport are land reclaimed which was constructed with the assistance of the Deepest dynamic compaction application on the good airport project.
• The challenge was to compact 20,000,000 m³ of land reclamation while maintaining traffic.
• The 'Giga-machine' was specifically designed and custom-built for this job. The machine consists of 168 wheels and seven km of hydraulic hoses and also sets a record.
• The 200-ton pounder was assembled with the help of 600 kg nut screws tightened by a bulldozer. The pounder created a 70 m3 crater after three drops, which required seven truckloads to fill.

Benefits and Commercial Aspects –

• Aviation's economic impact is estimated at 2,960 billion US dollars, cherish 8% of the world's GDP.
•The civil aerospace sector (which includes the production of aircraft systems, frames, engines, and other components) employs 730,000 people.
•It also provides 5.8 million indirect jobs through purchases of products and services from companies in its supply chain.
•International visitors arriving by air support direct tourism jobs.

Port of Brisbane (Australia)

The port is currently Australia's third busiest port and the country's fastest-growing container port.

• The key materials traded through the port include coal export, oil (crude and refined), and motorcar imports.
• The Port of Brisbane was underwater until 43 years ago.
• The change occur in 1977 when after much work, 1800 hectares of latest land were reclaimed from Brisbane River to show Fisherman Island into a port.
• Consistent with Brisbane Times, around 2750 ships come through the Port of Brisbane annually.

About Construction -

• Hall Contracting, who owns the CSD Amity, was engaged in 2012 to dredge Berths 12 and 13 and supply up to 500,000m3 of land reclamation.
• The fabric consisted of sentimental to firm clays and a few sands.
• because the reclaimed subgrade consists of sentimental clays, specialists advise from time to time to confirm the protection of the land reclamation crews and also the effectiveness of the reclamation.

Benefits and Commercial Aspects -

• Port of Brisbane Pty Ltd's (PBPL) sustainable approach to dredging material management focuses on both important long-term sediment reduction to reduce future maintenance dredging requirements and beneficial reuse to form a brand new port.
• In 2019, PBPL established a Dredging Technical Advisory Consultative Committee to extend transparency and stakeholder input into PBPL's dredging activities including government, research, Indigenous, non-government, and community stakeholders.
• It annually manages to get rid of approximately 450,000 cubic meters of fine sediment from channels.
• It helps in supporting long-term projected trade growth and market demand by developing a replacement port.
• It also helps within the reduction of maintenance dredging through modeling of sediment dynamics to tell efficient dredging practices and also the management of sediment sources.
• The Port's 224-hectare Future Port Expansion (FPE) area comprises internal paddocks at various stages of reclamation. Reclamation is predicted to continue until 2050 thanks to an extra increase in demand.

Giant sea wall, Jakarta

• In recent years, Jakarta has been plagued by frequent floods amid peaks in the rainy season as infrastructure and water management are not adequate.
• This results in the temporary relocation of tens of thousands of people in January (the peak of Indonesia's rainy season).
• Another problem is even more complicated.The city of Jakarta is sinking at a pace of 7.5 to 14 centimetres every year.
• This is due to deep groundwater extraction in combination with pressure from high-rise buildings in Jakarta.
• Thus it is forcing the migration of more than four million people as the northern part of the city will be gradually submerged by the sea if no immediate action is taken.
• In fifty years, the sea level is expected to be three to five meters above Jakarta's street level.
• Flooding from rivers is predicted to intensify by 2025, when most rivers will cease to discharge to the sea under gravity.

About Construction –
• The Provincial Government has finished the building of the National Capital Integrated Coastal Development (NCICD) coastline levee in North Jakarta's coastal area, covering 12.6 kilometres of the 46-kilometer priority target.
• The project will be integrated with a water reservoir and other land reclamation works involving 17 artificial islands. In 2025, the project is projected to be completed.
• Jakarta Bay would become a water reservoir enclosed in the Giant Sea Wall and would eventually become a source of clean water for the entire city.
• Large lagoons are being built inside the wall to cushion discharge from Jakarta's 13 rivers. The government, state-owned businesses, and the private sector are all contributing to the initiative.
• The Great Garuda project, is designed to protect until the year 2080, assuming mid-range land subsidence and sea-level rise over this time frame.

Benefits of the Mega Project –
• The mega project will strengthen and enhance the existing coastal dikes along 30 kilometers, and the construction of 17 artificial islands in the bay of Jakarta.
• Giant Sea Wall will include an airport, harbor, toll road, residential area, industrial area, waste treatment, water reservoir, and green areas, on a space of about 4000 hectares.
• During construction the former bay shall be converted into a sealed reservoir, the water table of which ought to be regulated to remain below sea level in the future, thus allowing for the controlled flood drainage of the city.
• To achieve this, the largest pumping station installation ever built in one project is planned at a capacity of 730 cubic meters per second to pump the water from the reservoir out into the sea.
• The plan also includes renovations and expansions to the city's current flood protection infrastructure, including retention reservoirs, drainage canals, and flood protection barriers along the main thoroughfares, waterways, and the coastal dam.

Palm island, Dubai
• The construction adds 520 km of beaches into the city.
• Its main purpose was to increase Tourism by providing a one-of-a-kind tourist destination
• To increase the GDP of the country by investments in Real Estate.
• To show the entire world about the advancements in construction by constructing an Artificial Island in the sea.

Construction of Palm Jumeirah –
• Land reclamation began in 2001, and construction of the Palm Jumeirah began in 2002.
• The island required 94,000,000 m3 (3.3×109 ft3) of sand and 7 million tonnes of rock.
• Dredgers poured/deposited dredged sand onto precise areas in the 10.5 m-deep seabed to form the Palm Jumeirah.
• Jan De Nul, a Belgian corporation, and Van Oord, a Dutch company, were in charge of this process.
In a procedure known as rain-bowing, sand was sprayed over the desired area by dredging ships guided by DGPS.Calcareous sand was mainly used for the reclamation.

Benefits and Commercial Aspects –
• It aids in job placement by A direct increase in output of $7.789 million, 53 new jobs, $5.337 million more in wages and salaries, and a $6.624 million gain in value-added all help.
• Flow-on industrial effects in terms of local purchases of goods and services occur as a result of this direct expansion in the economy, and these indirect effects are estimated to result in a further increase in output valued at $0.249 million, 3 more jobs, $0.092 million more paid in wages and salaries, and a gain of $0.126 million in terms of value-added.
• After one year of construction, the first occupants arrived in 2007 in Palm Jumeirah and about 75% of the properties were handed to owners. By the conclusion of the year, 500 families had made their homes on Palm Jumeirah. At the end of 2009, there were a total of 28 hotels on the Crescent, ready to welcome visitors.
• At the end of 2009, there were 28 hotels in total opened on the Crescent to welcome tourists. More than 100 studies were commissioned to analyze the extent of the Palm Jumeirah project.
• Civil engineering, marina design, transportation, and technology were all considered key parts of the project.

Kansai international Airport, Japan

• The construction of new airports became a national priority in the mid-1960s.
• The Ministry of transport was responsible for airport planning in Japan.
• The national government allocated 115 billion yen for the airport construction program in the 1st airport plan.

About Construction –
• Approximately 180 million cubic meters of reclamation fill materials was used o construct he 511ha Island 1st
• Approximately 250 million cubic meters of reclamation fill materials was used o construct he 545ha Island 2nd
• The construction of Airports Island consisted of four sages:
1. Installation of vertical sand drain in the Ma13 clay layer following placements of a sand blanket on the sea floor.
2. Construction of the seawall around the reclamation site,
3. Reclamation of the airport Island and
4. Construction of airport facilities.

Benefits and Commercial Aspects –

• Its position at the entrance of Northeast Asia makes the airport a gateway for Asia and the world (Europe and America)

• Strategic and promising industry plants are centralized in the Kansai region, such as lithium, solar battery, and pharmaceutical related business.

•24-hour operation short lead-time model.

•Cool chain – Efforts to be the only airport for shipping medicines.

•Joint fixed – temperature storage for medicines first in Japan.

IV.CONCLUSION:

Reclamation continues to be a significant means of providing land to meet the needs of expanding population and economic development. The methods and techniques applied in each case should depend on the objectives defined for the reclamation. On a global scale, the land is becoming a scarce resource, Increasingly, there has been an effort devoted to resolving, or minimizing, the problem.

Land reclamation from abandoned mines is a big problem all over the world. There has been an increasing focus on resolving or minimizing the "environmental liabilities" of these locations. Reclamation of abandoned mining land should be done in stages. Each site's conditions were taken into account in the process. Degraded mine reclamation can range from not too difficult to quite tough when approached holistically.

As a result, in some circumstances (e.g., tiny mines), it may be appropriate to enable a spontaneous biological colonization process to take place, making use of the regional species pool and the mine site's biodiversity hosting potential. Conducting effective environmental reclamation of a mine, treating polluted materials, and monitoring the site's capabilities, on the other hand, As a result, a mining site reclamation's long-term effectiveness necessitates coordination among geologists, hydrologists, chemists, biologists, soil scientists, agronomists, landscapers, engineers, economists, and others.

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