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Augmentation of Cities on Waterfronts

Creating land on Water

Author: Yash Ketan Shah

BE Civil Student

Datta Meghe College of Engineering, Navi Mumbai, India

Abstract: In today's highly populated world we have started facing shortage of many resources. Land being one of them. Any living creature needs a place to stay, it's one of the three necessities. But because of growing population we are running out of land. Especially the cities, these have become overcrowded. The land prices here are going up day by day which shows the need of land in these Cities. This need has made humans expand the Cities into places like farmlands and natural vegetations resulting in environmental harm. Deforestation and cutting mountains along with damage to biodiversity, water, and climate are a few effects of this expansion. It causes an irreversible effect in nature. It is time to find an alternative method to expand these Cities which shall cause minimum losses to surroundings. This study will dive deeper into potential solutions to this problem.

I have been living in the City of Mumbai for Twenty-One years now. I have seen the demographics here grow exponentially. Better lifestyle, more opportunities and high paychecks are a few reasons that people are drawn to work and reside in urban areas like Mumbai, increasing the need of usable land. To solve lack of land problem, Mumbai has begun sprawling outwards on farmlands. Such a problem in Mumbai and many other coastal cities in the whole world can be solved by a few methods where we increase the land mass of coastal areas of these cities onto water which helps in increasing the overall land area of that city.

Keywords: *Expanding Cities, Urban Development, Creation of Land on Water*

1. INTRODUCTION

Urban areas have a constantly increasing demand for real estate. Most of the human population today lives in mega cities. Our current urban population of around 4 billion is expected to reach approximately 6.5 billion by 2050. If we continue to spread in present land, we will cause a lot of damage to mother nature. To attack this problem, we have a wonderful alternative to expand coastal Cities, which is expanding these Cities on water bodies. This would considerably decrease the harm to nature and give the same result. Many countries are practicing this method to create islands. We will further see how this concept can be used to expand our coastal Cities.

2. LITERATURE REVIEW

Homo Sapiens have always tried and tested constructing new and unique ideas to build settlements in inhospitable areas like polar regions, sea and now also on Mars. Many countries are in this race to find the best alternative. To build on the sea, concept of VLFS (Very Large Floating Structures) is widely known and being experimented on. The second solution being used is of land reclamation. Dubai's Palm Islands are a great example of this method. The latter was used to create land in Netherlands with other techniques. They slowly pushed water back building dikes and creating polders. After which canals and pumps were used to drain the land and keep it dry.

One classic example related to this topic is the Hong Kong International Airport opened in 1998. They moved 367 cubic meters of sand, stones, and gravel. It is a partly man-made island. A company named Fibertex had developed a few materials which assisted them complete this project. Sri Lanka is also creating a City called Colombo International Financial City on a reclaimed land of 660 acres from the Indian Ocean. Many such examples are present. Similar methods and concepts can be used to augment our coastal Cities.

3. DISCUSSION

Today the concept of VLFS (Very Large Floating Structures) is trending. These can be used for small settlements, restaurants, small houses, etc. There are two main types of VLFS technology that can be used to carry the weight of a floating settlement. The first, pontoon structures these are flat slabs suitable for floating in sheltered waters close to shore. The second, semi-submersible structures (such as oil rigs), comprise platforms that are elevated on columns off the water surface. These can be in deep waters. Such technologies can be used to serve as an extension of a coastal city.

Another technology/concept which can be used to create land is Land reclamation. It is the process of creating new land from the sea. The method of land reclamation involves filling the area of sea with large amounts of heavy rock and/or cement, then filling with clay and soil until the desired height is reached. We can use this technique to fill the sea near coastal lines of cities. The main concept here is increasing the land area of a coastal city by filling the coastal line with adequate materials and then covering it with substances like soil resulting in the formation of usable land. Coastal life can be temporarily affected as a result, but with proper care it can be retained at the newly formed coastal areas. What we will be doing is here is just pushing back the water towards sea/ocean.

A metropolitan city always has redevelopment projects going on which makes tons of debris. We can use this debris as one of the materials to fill the sea. Waste plastic is another material which will help a lot. With proper processing of this plastic and adding virgin plastic we can create a good material. If there is a desert nearby, the sand from there can be used too, but if it is far away then the transportation cost should be considered. An alternative to obtain materials for filling is to get it from those coastal lines which are of not much importance. It can be transported by ships from source coastal line to destination. This won't change the sea levels in future if all cities adapted this concept.

There are a few limitations to this concept. We can't use this in places which is prone to Earthquakes. The city of Mumbai is a good example to carry out this method as the waters around are calm, it isn't an earthquake prone zone and has accessibility to a lot of debris. Once the filling is done, we need to lay a thick layer of soil to make land good for agriculture too. Draining of submerged wetlands while land reclamation process is often used to reclaim land for agricultural use. We can use this method to counter the future attack of increasing sea levels due to global warming by increasing the height of land created. The only barrier these have is the economical one, Engineering barriers can be dealt with, but political and commercial barriers aren't allowing this to take off.

4. CONCLUSION

The concept stated in this study not only helps one but two huge real-life problems, one being the shortage of land and other being the threat to coastal cities due to increment in sea levels. Shortage of land is tackled with creation of new usable area and increasing sea level threat can be solved by adopting the optimum of height for newly made coastal line. Deep engineering researches will be needed with well financial help. Even though the costs will be enormous today, it would be worth it tomorrow. The marine life must be kept in mind while implementing this idea. Keeping in my mind the broader perspective, whole world should participate to develop this concept and conduct a profound study. Special attention to Geotechnology is required and we must not forget to take care of the marine biodiversity. Once this method is implemented, we will have bigger urban cities which would contribute towards a better tomorrow. This concept has many advantages as stated, but it is an expensive way. Value engineering needs to be implied at its best. Transportation costs are one of the major expenses which needs to be minimized. Holistically viewing, this concept has a huge potential to solve a major problem and give us larger cities.

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