Analysis & Construction of Artificial Island

Radhika Thakare[1], Agnel Koriyan[2], Aryan Gupta[3], Om Parmar[4], Arbaz Shaikh[5]
[1]*Assistant Professor, Department of Civil, Shree L.r Tiwari College of Engineering.*
[2,3,4,5]*UG Student, Department of Civil, Shree L.r Tiwari College of Engineering.*

Abstract- **In response to the growing demand for tourist destinations, an artificial island constructed in Dwarka using dredged sand promises to be an exciting new attraction. However, the island's sustainability and longevity are dependent on careful planning and design to prevent natural erosion from causing failure. The construction process involves utilizing sand dredged from the seabed to create a stable land mass. The island's design must include measures to mitigate erosion, such as sloping the sides and planting vegetation to stabilize the sand. Once complete, the island will provide a unique experience for tourists and help boost the local economy. However, ongoing maintenance will be necessary to ensure its continued success. Overall, the construction of an artificial island in Dwarka offers a creative solution to preserving and enhancing the natural beauty of the region while providing new opportunities for tourism.**

***Index Terms*—Awareness, Migrant, Sustainable, Silt content test.**

I. INTRODUCTION

Dwarka is a culturally rich coastal city in Gujarat, India, known for its ancient Hindu temples and growing tourism industry. While the city's location provides ample opportunities for water-based activities, including fishing, this has led to pressure on the marine ecosystem. To address this issue and diversify the local economy, the construction of an artificial island made of dredged sand has been proposed. This new tourist attraction will generate revenue for the city while reducing reliance on fishing and preserving the marine ecosystem. Overall, the construction of an artificial island in Dwarka promises to promote sustainable economic growth and preserve the city's natural beauty.

An artificial island is a human-made structure built in a body of water, typically the ocean, by depositing materials such as sand, rock, or concrete. These islands are constructed for a variety of purposes, including commercial use, recreation, and tourism, and are often built in areas where natural land is limited or unavailable. The construction process involves careful engineering and environmental considerations, including the stability of the material used, the impact on the surrounding ecosystem, and the ability to withstand natural forces such as waves, currents, and erosion. Despite the challenges, artificial islands have become increasingly popular in recent years as a way to address the demand for land and to create new opportunities for economic growth and development.

II. PROBLEM STATEMENT

Island communities face a range of challenges, including the threat of sinking and soil erosion due to climate change. To mitigate these risks, various methods can be employed. For example, the construction of sea walls and the introduction of coral reefs can help to prevent erosion and protect against rising sea levels. Additionally, addressing population issues can involve migrating people to the island and expanding the land territory to provide employment opportunities. This can help to reduce the strain on resources and promote economic growth. However, it is important to note that these measures are not always without their drawbacks. The construction of sea walls, for example, can have negative impacts on marine ecosystems, while the introduction of coral reefs can also lead to unintended consequences if not properly managed. Overall, proactive measures must be taken to protect island communities and their natural environments. This may involve a combination of solutions, including the use of sustainable building materials, the implementation of effective waste management systems, and the promotion of renewable energy sources. By taking a holistic approach to sustainability, island communities can thrive while also safeguarding their unique ecosystems for generations to come.

III. OBJECTIVES

- To implement measures and techniques that will ensure the stability and prevent the sinking of the

proposed artificial island in order to avoid any potential hazards and ensure its longevity.

- To conduct a feasibility study and propose the creation of an artificial island in Dwarka, considering factors such as environmental impact, cost-effectiveness, and potential benefits such as increased tourism and economic growth for the region.
- To create employment opportunities in a specific region or industry, by implementing policies and initiatives that encourage job growth.
- To encourage population migration to the proposed artificial island, by providing incentives such as affordable housing, employment opportunities, and access to essential services and amenities.

IV. LITERATURE REVIEW

Muhammad Salman Afzal, Furqan Tahir, and Sami G Al-Ghamdi (2022) There are several obstacles to achieving sustainable AID. These barriers include insufficient scientific data, inadequate site selection, ineffective environmental assessments, failure to comply with regulations, and prioritizing economic benefits over environmental considerations

Xiao Zheyu, Qi Hongshuai, Cai Feng, Liu Gen, Zhao Shaohua, Zhu Jun, Lei Gang, and Yin Hang (2022) The considerable impact that building artificial islands can have on the distribution patterns and transportation processes of seabed sediments in offshore regions. The focus of their research was the Nanhai Mingzhu (NHMZ) artificial island and its influence on the features and distribution of seabed sediments in Haikou Bay.

Lee E Harris (2009) Coral reefs can prevent erosion of artificial islands by breaking up the energy of waves, stabilizing sediments, and providing ecosystem services. However, the environmental impacts of artificial island development on coral reefs must be carefully considered and minimized.

C.M.G. Vivian, L.A. Murray (2009) Dredging can be used to construct artificial islands by removing sediment or rock from the seabed and depositing it in a designated area. However, dredging for island construction can have negative environmental impacts, and mitigation measures and monitoring are necessary to minimize them and ensure sustainable construction.

IV. METHODOLOGY

A. The construction of an artificial island using the dredging method typically involves the following steps:

1. Site Selection: To construct an artificial island, the first step is to carefully choose a suitable location that can provide adequate depth and soil characteristics required for supporting the island's construction.
2. Environmental Assessment: Before beginning the construction of an artificial island, an environmental assessment is carried out to determine and mitigate any potential negative impacts that the construction process may have on the surrounding ecosystem.
3. Dredging: After site selection, the next step in constructing an artificial island is to excavate soil or sand from the seabed using heavy machinery like dredgers. This process, called dredging, involves the removal of the material, which is then transported to the construction site through the use of pipelines or barges.
4. Reclamation: Once the required amount of material has been dredged, the reclamation process commences by depositing the excavated soil or sand on the construction site. This forms the foundation of the artificial island, and the process may need to be repeated until the desired area and height of the island are achieved.
5. Soil Stabilization: To ensure the stability of the artificial island and prevent soil erosion, the soil on the island must be stabilized. This can be achieved through measures such as compacting the soil, using geotextiles or other stabilization techniques
6. Construction: After stabilizing the foundation and soil of the artificial island, the construction process can commence. This involves the building of infrastructure such as roads, buildings, and other facilities required for the island.
7. Monitoring: It is crucial to carry out regular monitoring of the stability and environmental impact of the artificial island to ensure its sustainability and long-term success.

In summary, to construct an artificial island using the dredging method, it is essential to go through a series of steps, including selecting a suitable site, carrying out an environmental assessment, dredging,

reclamation, soil stabilization, construction, and monitoring to ensure the island's stability and long-term success.

B. Prevention of failures: When artificial islands show signs of instability or failure, several measures can be taken to strengthen them. Here are some possible approaches:

1. Reinforcement of the foundation: If the foundation of the artificial island is weak or settling, reinforcement measures such as driving piles or installing geo-fabric or geo-textile layers can be employed to strengthen the foundation and provide additional support to the island.
2. Revetments or seawalls: Construction of revetments or seawalls using materials such as concrete or rock can help protect the artificial island from erosion caused by waves or currents. These structures can provide additional stability and prevent further deterioration.
3. Soil stabilization: The soil on the artificial island can be stabilized using methods such as compaction, chemical stabilization, or geotextiles. These measures can help improve the bearing capacity and shear strength of the soil, enhancing the stability of the island.
4. Vegetation: Planting vegetation on the island can help stabilize the soil, prevent erosion, and provide additional stability. Suitable plant species with deep root systems can help bind the soil together and protect against erosion.
5. Monitoring and maintenance: Regular monitoring of the artificial island's stability, including the monitoring of soil conditions, water levels, and structural integrity, is crucial. Timely maintenance and repairs can be undertaken to address any signs of instability or failure promptly.
6. Engineering solutions: Depending on the specific conditions and challenges faced by the failing artificial island, other engineering solutions such as geotubes, gabions, or breakwaters may be considered to strengthen the island and prevent further failure.

It is important to assess the specific conditions and requirements of the failing artificial island and consult with qualified engineers and environmental experts to determine the most appropriate and effective measures for strengthening and ensuring the stability of the island.

V. RESULTS AND DISCUSSIONS

A. Grain size sieve analysis is a technique used to determine the particle size distribution of a sediment sample, following test was conducted and results are illustrated below.

	Batch 1		Batch 2		Batch 3	
sieve size	retaining	%	retaining	%	retaining	%
850micr	39	19.5	65	32.5	46	23
600 mic	40	20	39	19.5	31	15.5
2.5 mm	10	5	15	7.5	10	5
75 mic	107	53.5	80	40	109	54.5
pan	4	2	1	0.5	4	2

B. The Standard Proctor Test is a laboratory test used to determine the maximum density of compacted soil by measuring the moisture content and compaction energy required to reach that density and the results were obtained.

Sample no.	weight	WET	DRY
container no.1	31g	187	160
container no.2	30g	203	190
container no.3	34g	185	172

VI. CONCLUSIONS

- In conclusion, the construction of artificial islands has the potential to address multiple challenges related to population growth, urbanization, and tourism development.
- Building these islands can provide a new habitat for people, while also offering opportunities for economic growth through tourism development. However, it is important to carefully consider the environmental and social impacts of such projects, as well as the long-term sustainability of the islands.
- Proper planning and management strategies must be put in place to ensure the safety and well-being of the residents and visitors.
- Overall, the construction of artificial islands can be a promising solution to the challenges faced by growing cities and tourism industries, but it must

be approached with caution and consideration for the potential consequences.

REFRENCES

[1] Abraham M., Kuriakose B., Kuruvilla R. (2017), "Static Analysis of Gravity Dams Considering Foundation-Structure Interaction", Article in Applied Mechanics and Materials · January 2017, ISSN: 1662-7482, Vol. 857, pp 237-242 Revised: 2016-08-10, DOI: 10.4028/.https://www.researchgate.net/publication/310241448_Static_ Analysis_of_Gravity_Dams_Considering_Foundation-Structure_Interaction

[2] Rao N., Srinivas N., Rao B., Sankar G., Rao V., Amminedu E., Venkateswarlu N., Rajesh N., Rao P., and Kumar M. (2011), "Study on Nagarjunasagar to Somasila link canal alignment and its impact on environment using IRS-P6 AWiFS data", J. Ind. Geophys. Union (April 2011) Vol.15, No.2, pp.113-124

[3] Land in Water: The Study of Land Reclamation and Artificial Islands Formation in the UAE Coastal Zone

[4] B Prabowo[1], N Rikardi[1], M A Setiawan[2], P Santoso[3], D Arafat[3], B Subhan[3] and A Afandy https://iopscience.iop.org/article/10.1088/1755-1315/967/1/012038

[5] Artificial Islands Renuka. R 1, Chetana. M. V2, Rekha. A. M3, Soumyashri. R4 Assistant Professor1, 2, 3, 4 Department of Civil Engineering Jain Institute of Technology, Davanagere, India

[6] Assessing vulnerability: an integrated approach for mapping adaptive capacity, sensitivity, and exposure

[7] Clim. Change, 136 (2016), pp. 615-629, 10.1007 /s10584-016-1642-0

[8] Coastal protection by coral reefs: a framework for spatial assessment and economic valuation

[9] Ocean Coast. Manag., 96 (2014), pp. 94-103, 10.1016/j.ocecoaman.2014.05.001

[10] Wave-induced extreme water levels in the Puerto Morelos fringing reef lagoon

[11] Nat. Hazards Earth Syst. Sci., 12 (2012), pp. 3765-3773, 10.5194/nhess-12-3765-2012