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Underwater Structure

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Abstract
By the end of 21st century nearly 2.5 million properties will be at risk of chronic flooding due to several reasons such as sea level rise, thermal expansion, climate change, global warming and in order to overcome those future disasters we will have to be prepared with options to accommodate the millions of populations under the sea and create a proper environment for next generation civilization i.e. underwater structure.
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I. INTRODUCTION

Approximately 71% of earth surface area is covered with sea water and 29% area available with us is land, which is may be very less in coming days to meet future demand and to accommodate 775 crores of population, shortage of land has always been a problem to mankind and in continents like Asia it may be challenging tasks for future.

The recent trends of sinking land into sea shows a tremendous rise all over the world. India lost 35sq.km land to sea in last century due to various climatic factors and climatic issues.

The idea of underwater structure and colonizing the cities under water comes from the sinking trends of lands. The design parameters and design considerations for safety and standard of living is a challenging task for both engineers and architects.

1.1 Fluid Mechanics

The whole structure is immersed itself in liquid hence the knowledge of fluid mechanics especially fluid statics, the mechanics of fluid at rest is an important parameter in establishing the whole structure.

The normal sea water is a mixture of salt and water, it contains 0.9 percent of sodium chloride with a density of 1023.6 kg/m3, making it denser as compared to freshwater and the salinity in water may cause may cause corrosion of machinery and infrastructure and may endanger green vegetation.

The pressure under water increases with depth they are directly proportional to each other, the pressure that is given at nonmoving fluid is termed as hydrostatic pressure which also plays important role in mud drilling process of geophysics. Archimedes principle states that the upward buoyant force that is exerted on a body that is immersed in fluid whether fully or partially is equal to the weight of fluid that the body displaces

1.2 Geometry

The geometry design process as till now the structures made are of cylindrical and spherical in shape because it requires minimum area to enclose volume and also withstand external pressure.

The geometric design can be compared from the submarines which consists two hulls the first one is pressure hull, it is designed to withstand the hydrostatic pressure at maximum operable depth of submarine and second is outer hull, in which hydrostatic pressure is negligible increases survivability at great depths.

1.2.1 Ocean Spiral

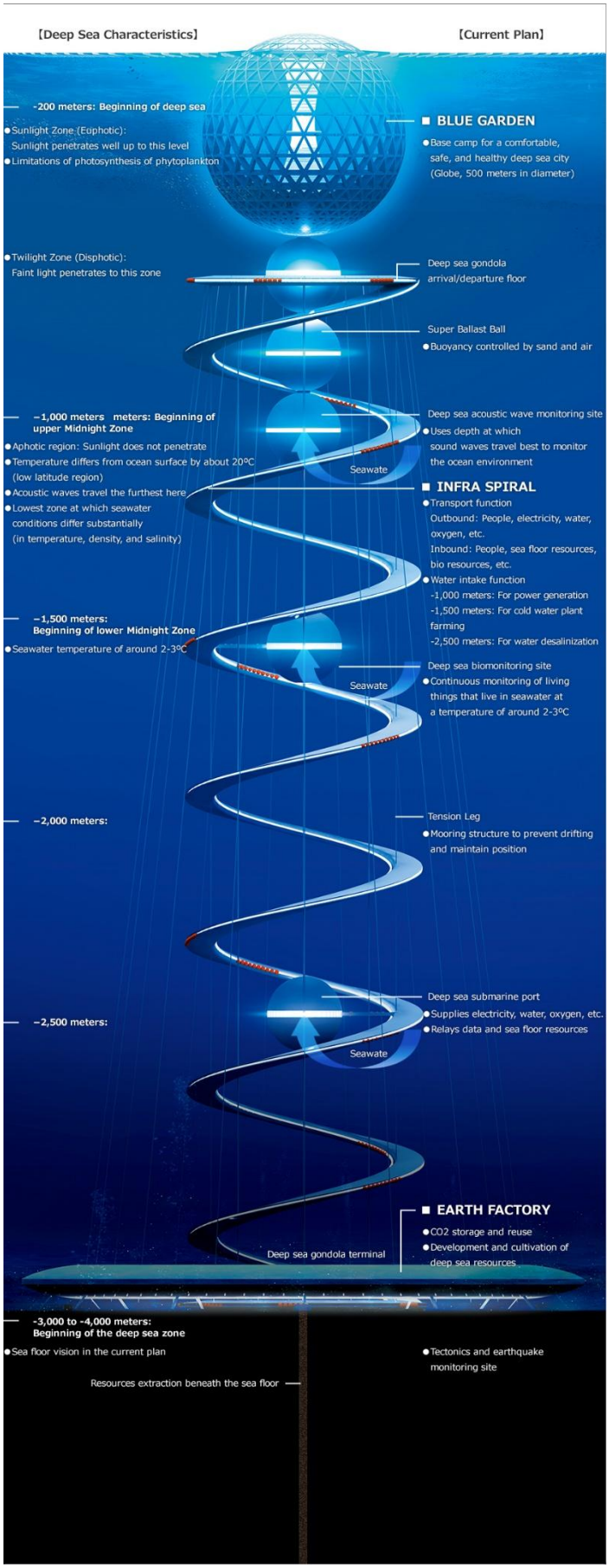
The ocean spiral is a deep-sea future city concept, working to restore the earth with power of deep sea.

It aims to a new life style where you can relax in casual zone facing the deep the sea and enjoy it, learn from it and communicate with other about it deep like deep sea sightseeing tour, health regimen with the high oxygen concentration in deep sea environment, comfortable, safe life style and workplace.

The Shimzu Corporation aims and offers the deep sea with multi functions that utilize the unique characteristics of the deep sea are all in one place.

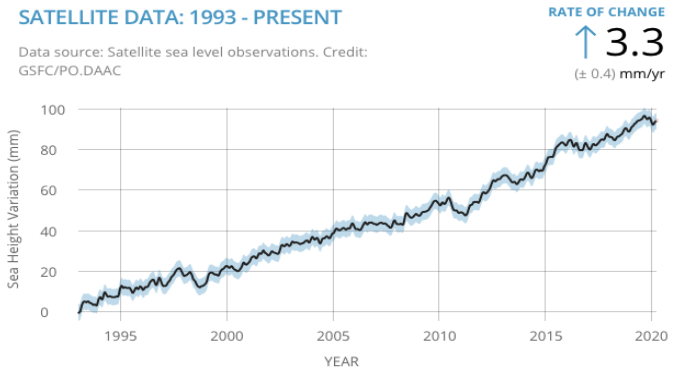
- Electricity: Power generation using ocean thermal energy conversion.
- Food: Plant cultivation using deep sea water.
- Fresh Water: Desalination using water pressure.
- Transportation: Deep Sea submarine port
- Information: Deep Sea monitoring site

The benefits that can be seen in the spiral city can be a healthy city with higher concentrations of oxygen than on land, a comfortable city with minimal temperature variations, producing methane from carbon dioxide and a safe city with unaffected by typhoons and earthquakes.



1.3 Atmospheric Control

Because of the confined environment where carbon dioxide and other atmospheric contaminants are accumulated should be eliminated by proper removal system and maintain a safe environment system in the cage. Control over heat loss and gain to condensation surveillance must be
Electrolysis can be used by splitting water constituents as oxygen and hydrogen.



1.4 Habitat

Drinking water inside the city can be obtained by desalinating the water by various processes such as reverse osmosis, thermal distillation or membrane distillation.

Communication with the outside world will be very difficult process under the sea water, adequate transportation system against the gravity and buoyancy will be needed.

Effects on health along with the radiation exposure and long-term effects may cause psychological changes, sleep deprivation, due elevated carbon dioxide for extended period, blood may become slightly acidic from higher concentration of carbonic acid may also lead to higher occurrence of indigestion and slow healing of minor injuries.

1.5 Material

High strength alloy steel, aluminum, titanium, glass reinforced plastic because of good resistance to corrosion, good sound absorption qualities, fire protection are most favorable.

II. CASE STUDY

2.1 Otter Inn

The other example for hotel was Otter Inn that started to operate in 2000. It was designed and built by an artist Mikael Genberg in Sweden. The "one room hotel" has two parts, over and below the waterline, were linked by a staircase. Above the waterline there is a raft with a typical Swedish wooden cabin. That cabin houses bathroom and kitchen whereas sleeping facilities are in the underwater part. The electricity supply is solar powered and air was supplied to underwater part by pipes. This example demonstrates the possibility of construction of underwater structures with simple and available technology and materials despite of its limitations and disadvantages. The idea of unusual accommodation that project offered is another purpose to evaluate this example.

2.2 Ithaa Undersea Restaurant

Ithaa- The Hilton Maldives Undersea Restaurant was opened on 15 April 2005 as a part of the Hilton Maldives Resort & Spa, sites in the Indian Ocean on Rangali Island. The structure sits 5 meters beneath the water surface. It is surrounded by coral reefs and offers panoramic underwater views. The restaurant was built by M. J. Murphy Ltd. using technology which is common in public aquariums.

2.3 Poseidon Undersea Resort

Poseidon Undersea Resort is a "permanent sea floor one-atmosphere resort" of which construction continues in a private island in Fiji. The structure will be situated on 40 feet (12.19 m) below the water level and the interior of the resort remains at surface pressure at all times. The underwater structure is a part of a complex which includes 20 bungalow resort and various entertainment functions. The structure was linked to the shore through a service tunnel in addition to the main access via a dock It was designed by engineers of U. S.

Submarines, Inc. which is a company active in design and construction of civil submarine for 13 years. The resort is scheduled to open on May 14, 2008.

III. CONCLUSION

It was observed that the man sea habitat will be very effortful as well expensive process with very high skilled engineering and architectural knowledge which can maintain a neutral environment all over the city and a healthy life with high level of oxygen concentration but counting it in a mega value projects the manpower along with the proper synchronization of man sea habitat is needed.

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