Sebastian Potes

Dr. Elisa Warford

Writing-340

6/11/13

# Floating Cities: Settling the Sea and the New Frontier

## Abstract

Many attempts have been made at building a floating city but only a few have been partially realized. Once thought to be a far off notion, the colonization of the ocean seems to be within reach. We will discuss a new method, proposed by scientist/engineer/inventor Alexander Bolonkin, that would create mobile, interlocking, floating ocean-platforms from which to build upon. This method, combined with an industry that would enable floating cities to flourish - the production of algae as biofuel - could lead to the next frontier.

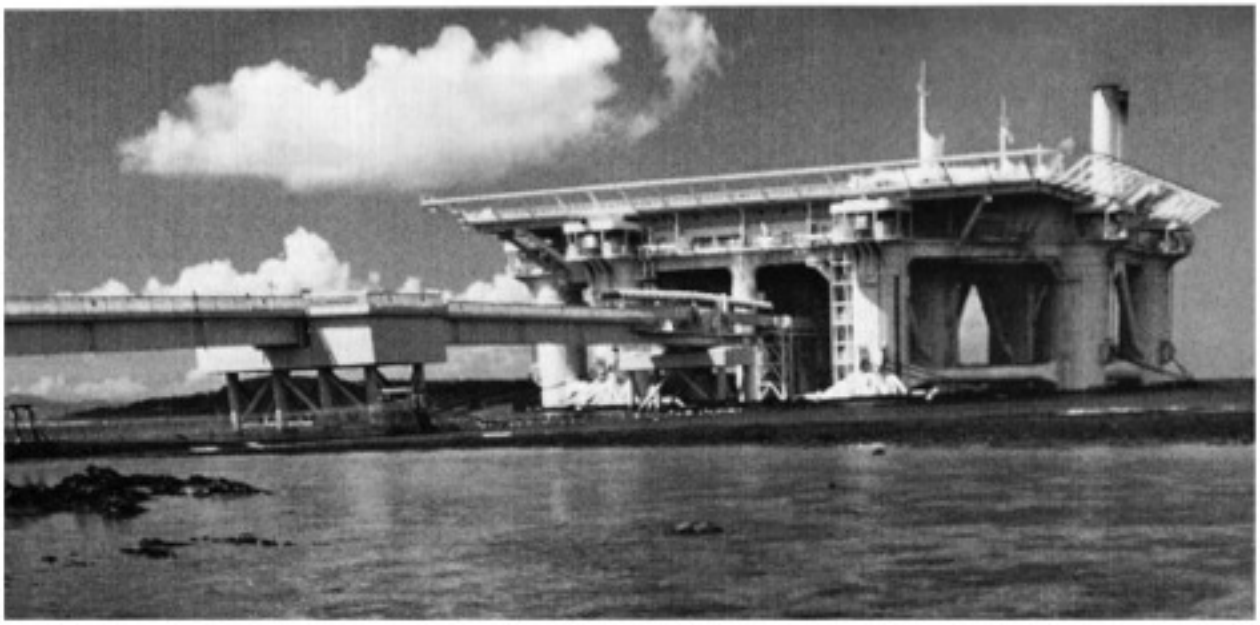
## Introduction

Ocean colonization is the theory and practice of permanent human settlements of oceans. These settlements may float freely on the ocean surface, be attached to the bottom of the ocean, or be somewhere in between [1]. The main reason for colonizing the ocean would be to expand the amount of livable area. Colonizing the surface of the ocean would also open up a whole new economy based on tourism, aquaculture (the farming of aquatic organisms such as fish, crustaceans, molluscs, and aquatic plants), and other ocean based industries. Ocean colonization would also provide a testing ground for space colonization. It seems that colonizing the ocean is

simpler and would probably occur first. The lessons learned from running an ocean colony may prove useful to future outer space colonization efforts. Floating cities are not a new concept. In fact, similar communities already exist in the form of houseboats, oil platforms, hotels, and cruise ships (which are often called floating cities). The technology needed to build a floating city already exists. Ocean colonization may be in the very near future and is the next step in continuing the spread of humanity.

## History of Floating Cities

The creation of remote settlements has been going on for over a half-century. On paper, at least. Architects and engineers borrowed technology from the fishing, military, and mining industries to address what they perceived as threats to human existence stemming from the Cold War [2]. Using these technologies, architects *proposed* designs for cities and colonies in harsh environments like deserts, the poles, and even outer space. Sandra Kaji-O'Grady, dean of architecture at the University of Sydney, briefly describes the history of such proposals [2]. In 1959, the English architect Ralph Erskine proposed a plan for a city in the subantarctic. Ten years later, German architects put forward numerous plans for future arctic settlements [2]. In 1971, French architect Jacques Rougerie proposed Thallasopolis I, a city of 45,000 made up of an accumulation of floating villages intended for the indigenous peoples of the Indonesian archipelago[2]. But the first of these Cold War-era projects to be realized was Aquapolis, built in 1975 in the Tokyo Bay harbor and designed by Japanese architect Kiyonari Kikotake. It was a prototype for marine cities but also served as a symbol for the ability of man to live successfully at sea [2]. Figure 1, below, shows Aquapolis as seen from shore; the bridge acts as a pier and



connects Aquapolis to the shoreline. Though Kikutake partially realized his vision of a city at sea, most marine city proposals at the time were considered utopian and failed to flourish [2].

**Figure 1. 'Aquapolis', Okinawa, Japan, architect Kiyonori Kikutake (1975). (Illustration from GA Document, Special Issue, 1970 to 1980.)** http://www.tandfonline.com.libproxy.usc.edu/doi/pdf/10.1080/13602360500285641

## Algae as a Catalyst

Floating cities sound cool, but what purpose would they serve, and why would people want to live there? Previous attempts were aimed at addressing the fear of overpopulation, taking advantage of some new market, or a combination of both. If the next frontier we are going to is the ocean, we would need a solid purpose. Any attempt at a self-sustaining ocean colony would need to produce an output that brings value by occurring on or in the ocean. Ricardo Radulovich,

an agricultural water scientist with a Ph.D. from UC Davis, claims that new floating cities would serve a commercial purpose. Much of his work centers on the link between floating cities and the commercial production of algae. The catalyst, he says,  is algaculture: the production of algae for commercial use. Radulovich claims algaculture would kickstart the ocean industry, expand, and evolve to customize and personalize ocean farmland. After the algaculture industry *has* taken off, ocean communities could evolve and become self-sustaining. It's an emerging industry with lots of potential. With the world seemingly facing a global energy crisis, we must look for alternative renewable resources to meet these demands.  In fact, there has a been a spike in engineers and scientists that are currently doing research on algae that may lead to algae biofuel. This could potentially replace our current dependency on fossil fuels. Half of algae's composition, by weight, is lipid oil. This oil could be converted into algae biodiesel, which burns more efficiently than petroleum [3]. Current production of algae for biofuel is very costly and uses large tracts of land [4]. A UCSD led study suggests that using the ocean as a medium for algaculture is not only possible, but is by far the best means of production as it does not compete with farmland for food production and does not need freshwater, which has become increasingly scarce [5]. If we can develop the technology to build floating cities, it seems that algae biofuel would spearhead this ambition.

**Developing the Technology**

The main limitations to building a floating city are cost and construction. One idea is to build a big ship. The Freedom Ship (figure 2), proposed by Norman Nixon and scheduled for construction in the next decade, would be the world's largest ship at 4,000 feet long (nearly a mile!) and 300 feet high. 17,000 residential units would house over 60,000 people. The Freedom

Ship will be powered by 100 diesel engines that enable it to circumnavigate the globe once every three years. But this ambitious project, intended for the rich, has a construction cost of 11 billion dollars. This cost would be passed on to the residents who will pay upwards of 11 million dollars for a suite on the Freedom Ship [6]. This is neat, but it's not attainable to everyone and doesn't address the problems of cost and construction.

**Figure 2. 'The Freedom Ship'. (Illustration located at khttp:// www.freedomship.com freedomship/ gallery/gallery.shl.)**

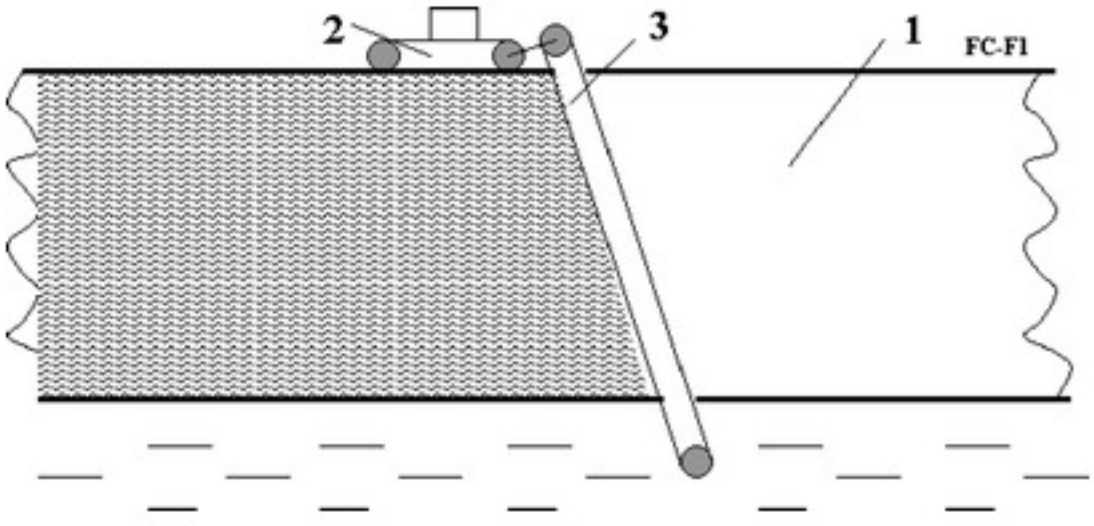



**Figure 3. Cutting of the floating platform from ice field. Notations: 1 – ice field in arctic (Antarctic) ocean; 2 – small tractor with band-saw or slicing wire saw; 3 – mechanical band saw or slicing wire saw. http://link.springer.com.libproxy.usc.edu/chapter/10.1007/978-90-481-9920-4_55/fulltext.html#Sec1**

The solution to these problems, not surprisingly, *lies* in the ocean. Russian Engineer and scientist Alexander Bolonkin recently proposed a promising new method for obtaining cheap ice platforms that could be used as floating foundations from which to build upon [7]. The method proposed involves taking ice platforms from the Arctic and Antarctic Oceans [7]. Once a suitable ice field is located, via helicopter scout, a tractor with an extendable wire-saw is lowered to saw up the platform (figure 3) [7]. The ice is then towed, insulated, and equipped with a coolant system that would enable it to float in warm waters without melting [7]. As crude as it sounds, this seems to be the most economical way to produce a massive floating platform. Its important to remember that the technology is still in the conceptual stage and there would be many difficulties in implementing this new method. For example, keeping a giant ice platfrom refrigerated in warmer waters would require a significant amount of energy. Also, removing large

amounts ice of from the arctic and antarctic threatens an already thinning ice shelf. We might have a long way to go before we create vast ocean farmlands and colonize a city at sea, but if technology prevails (as it always does), we could see a future with exciting new possibilities.

**Future Implications**

Although floating cities are still in the conceptual stages, the foundation is already in place and the future of ocean colonization is bright. Colonizing the ocean brings a whole new world of possibilities where we could see new forms of entertainment - new recreational activities or an exotic vacation spot - and a whole new growth of industry with its own self sustaining economy. The possibilities would be endless. Imagine a diverse network with various industries and many practitioners. Ocean communities could connect with others of similar interests, just as how the internet connects billions of computers. These communities could easily join and quit from others as they are free floating and mobile. Millions of people could migrate to this “new world.” With the worlds resources seemingly scarce, the ocean industry could provide us with an abundance of resources like never before. We might gain hundreds of years of extra time until perhaps one day, when we are technically and socially ready, go one step further... Space.

**References**


1.iastate.edu. “Ocean Colonization.” Internet: http://www.public.iastate.edu/~sws/OceanColonization.htm, October 1993 [June 5, 2013].

2. Sandra Kaji-o'grady, Peter Raisbeck. "Prototype Cities of the Sea.” The Journal of Architecture: Vol. 10, Iss. 4, 2005.

3. Newman, Stefani. "How Algae Biodiesel Works" 18 June 2008. HowStuffWorks.com. <http://science.howstuffworks.com/environmental/green-science/algae-biodiesel.htm> 12 June 2013.

4. Svoboda, Elizabeth. "The Greenest Green Fuel." PopSci. July 1, 2007.http://www.popsci.com/scitech/article/2007-07/greenest-green-fuel

5. Bradley J. Fikes. “Algae Biofuel Production Can Reach the Ocean.” UT San Diego. Nov. 28, 2012. http://www.utsandiego.com/news/2012/Nov/28/tp-algal-biofuel-production-can-reach-the-ocean/2/?#article-copy

6. Bonsor, Kevin. "How Floating Cities Will Work" 22 December 2000. HowStuffWorks.com. <http://science.howstuffworks.com/engineering/structural/floating-city.htm> 11 June 2013.

7. Stanley D. Brunn. “Engineering Earth:The Impacts of Megaengineering Projects.” Springer Science+Business Media B.V. 2011.