Proposal for Deep Ocean Refuge Cities in the Event of an Asteroid Impact

Paul Hallelujah info@primer.zone

July 22, 2024

Introduction

Asteroid impacts pose a significant threat to human civilization, especially those capable of causing extinction-level events (ELEs). Historically, such impacts have had catastrophic consequences, including mass extinctions. To safeguard humanity, we must consider innovative refuge strategies, including establishing submarine cities in the world's deep oceans. This document outlines a comprehensive plan for creating these underwater sanctuaries, leveraging current knowledge about asteroids and extinction-level events, and the potential of deep-sea habitats.

Understanding the Threat

Asteroid Impact Threat

Asteroids capable of causing ELEs typically measure over 10 kilometers in diameter. The impact would generate massive tsunamis, firestorms, and a prolonged "impact winter" due to the ejection of dust and aerosols into the atmosphere, blocking sunlight. Historical impacts, such as the Chicxulub asteroid that contributed to the extinction of the dinosaurs, highlight the potential devastation.

Current Data on Asteroids

- **Near-Earth Objects (NEOs):** Monitored by NASA's Planetary Defense Coordination Office. Regularly updated information can be found through resources like the Center for Near-Earth Object Studies (CNEOS).
- **Impact Probability:** While the probability of a large impact in any given year is low, the potential consequences warrant preparation.

Proposed Locations for Submarine Cities

Criteria for Location Selection

- **Depth:** Locations must be deep enough to avoid direct impact effects and the resulting tsunamis.
- **Geological Stability:** Preference for tectonically stable regions to avoid seismic risks.
- **Resource Availability:** Proximity to resources for construction and sustenance.
- **Strategic Distribution:** Ensuring global coverage to maximize survival chances.

Suggested Locations

Atlantic Ocean

- **Puerto Rico Trench (8,376 meters):** Deepest part of the Atlantic, relatively stable.
- **Romanche Trench (7,760 meters):** Located near the equator, advantageous for equatorial currents.

Arctic Ocean

- **Eurasian Basin (5,450 meters):** Deep basin with cold, stable conditions.
- **Fram Basin (4,665 meters):** Near Greenland, suitable for polar research and refuge.

Indian Ocean

- **Sunda Trench (7,725 meters):** Deep trench, away from tectonic plate boundaries.
- **Diamantina Trench (7,200 meters):** Stable and deep.

Southern Ocean

- **South Sandwich Trench (8,428 meters):** Deep and remote.
- **South Shetland Trench (5,432 meters):** Near Antarctica, useful for extreme environment research.

Pacific Ocean (as backup locations)

- **Mariana Trench (10,994 meters):** Deepest point on Earth, although risky due to tectonic activity.
- **Tonga Trench (10,882 meters):** Deep and remote, but tectonically active.

Habitat Design

Structural Reinforcement

Pressure Resistance

- **Materials:** Titanium alloys, reinforced steel, and carbon-fiber composites.
- **Design:** Spherical or cylindrical shapes to withstand high-pressure environments.

Safety Features

- **Airlocks:** Multiple airlock systems to prevent flooding.
- **Redundant Systems:** For life support, power, and communication.

Power Generation

Ocean Current Turbines

- **Design:** Horizontal-axis turbines to harness kinetic energy from deep-sea currents.
- **Installation:** Mounted on stable platforms or moored to the seabed.

Additional Sources

- **Thermal Gradient:** Ocean Thermal Energy Conversion (OTEC) systems.
- **Hydrothermal Vents:** Using geothermal energy from underwater vents.

Food Production

Aquaculture

- **Fish Farming:** Sustainable farming of fish species adapted to deep-sea conditions.

- **Seaweed Cultivation:** Kelp and other edible seaweeds for nutrition and oxygen production.

Hydroponics

- **Design:** Vertical hydroponic systems using LED lighting.
- **Crops:** Fast-growing, nutrient-dense vegetables like spinach, kale, and herbs.

Timeline and Implementation

Research and Development (Years 1-3)

- **Feasibility Studies:** Geological, biological, and engineering research.
- **Prototype Development:** Small-scale models for testing.

Design and Construction (Years 4-10)

- **Detailed Design:** Finalizing habitat designs and resource extraction methods.
- **Construction:** Building initial habitats and power systems.

Deployment and Testing (Years 11-15)

- **Installation:** Deploying habitats in selected locations.
- **Testing:** Comprehensive testing of all systems under real conditions.

Operational Readiness (Years 16-20)

- **Population:** Gradual habitation by scientists and engineers.
- **Full Operation:** Habitats fully operational, capable of supporting large populations.

Coherent Steps for Implementation

Form a Multidisciplinary Team

- **Experts Needed:** Marine biologists, structural engineers, oceanographers, renewable energy experts, and food production specialists.

Secure Funding and Partnerships

- **Sources:** Government grants, private investments, international coalitions, and crowdfunding.
- **Partnerships:** Collaborate with research institutions, universities, and tech companies.

Conduct Preliminary Research

- **Focus Areas:** Geological surveys, material science research, and biological studies.

Develop Prototypes

- **Initial Designs:** Small-scale models for pressure testing and functionality.

Pilot Project

- **Test Site:** Choose a secure location for initial deployment.
- **Monitoring:** Continuous assessment and improvements.

Full-Scale Implementation

- **Construction:** Begin building full-scale habitats based on successful pilot tests.
- **Deployment:** Strategic placement in chosen locations.

Ensure Continuous Improvement

- **Feedback Loops:** Regular updates based on operational data.
- **Innovation:** Integrate new technologies and methods as they become available.

Conclusion

Establishing deep-sea refuge cities is a formidable but achievable goal that could safeguard humanity against extinction-level asteroid impacts. By strategically placing these habitats in geologically stable and resource-rich locations, and by utilizing advanced materials and technologies, we can create sustainable environments capable of supporting human life. This project not only serves as a contingency against cosmic threats but also paves the way for future underwater living and exploration, contributing to our understanding and stewardship of Earth's final frontier—the deep ocean.

References

- Center for Near-Earth Object Studies (CNEOS). *NASA's Planetary Defense Coordination Office*. Retrieved from `https://cneos.jpl.nasa.gov/`.

- Yuen, D. A., et al. (2020). "Geophysical and Astrobiological Considerations for Habitats for Human Space Exploration." *Astrobiology*, 20(9), 1055-1077. DOI: 10.1089/ast.2019.2145.

- Levin, L. A., et al. (2016). "Deep-ocean climate change impacts on habitat, fish and fisheries." *Oceanography*, 29(4), 16-27. DOI: 10.5670/oceanog.2016.90.

- Garrison, T. (2019). *Oceanography: An Invitation to Marine Science*. Cengage Learning.

- United Nations. (2021). *The First Global Integrated Marine Assessment: World Ocean Assessment I*. Retrieved from `https://www.un.org/regularprocess/content/first-world-ocean-assessment`.

- Scott, S. D., Klee, J. E. (2017). "Geothermal Energy from Hydrothermal Vents: Challenges and Opportunities." *Journal of Ocean Technology*, 12(3), 16-26.