

# Table of Contents

- 6. Ethical and Deontological Concerns** ..... 3
- 6.1 Introduction ..... 3
- 6.2 Engineering Ethics ..... 3
- 6.3 Sales and Marketing Ethics ..... 4
- 6.4 Environmental Ethics ..... 4
- 6.5 Liability ..... 4
- 6.6 Summary ..... 5



## 6. Ethical and Deontological Concerns

### 6.1 Introduction

The deployment of technological solutions within natural and often fragile marine ecosystems involves significant ethical considerations. This chapter examines the deontological principles that have guided the decision-making process, with the aim of ensuring that the proposed intervention does not unintentionally harm the systems it is designed to protect.

Key considerations include the long-term lifecycle of materials, particularly in relation to preventing marine pollution and the accumulation of debris. In addition, the integrity and reliability of the environmental data collected are of central importance, as such data must accurately reflect ecosystem conditions. The ethical implications of material selection, including the use of reusable versus virgin resources, are also addressed.

This chapter highlights the responsibility of engineers to ensure transparency and objectivity in reporting project outcomes. Providing accurate and unbiased information about the performance of the habitat is essential to avoid misleading claims and to prevent “greenwashing.” In this way, the project seeks to uphold principles of responsible engineering and contribute to genuine ecological stewardship.

### 6.2 Engineering Ethics

Engineering ethics play a critical role in the design and development of artificial marine habitats intended to support endangered fish species. Structures must be designed with a high degree of structural integrity, durability, and reliability to withstand harsh marine environments and maintain long-term functionality. Engineers have a responsibility to ensure that both the habitats and any associated monitoring systems are safe for marine organisms, installation personnel, and the surrounding environment. Equally important is the need to minimize ecological disruption. Artificial habitats should be carefully designed to avoid damaging the seabed or interfering with existing ecosystems. Instead, their purpose should be to complement and enhance natural habitats, thereby promoting biodiversity and ecological balance.

Material selection is another key ethical consideration. Engineers must prioritize the use of non-toxic, environmentally sustainable, and long-lasting materials. The production processes involved in creating these habitats should follow to principles of sustainability, ensuring that environmental impact is minimized throughout the lifecycle of the project.

Transparency is an essential in ethical engineering practice. Engineers should ensure that all data collected through habitat monitoring systems is accurate, openly shared, and reported honestly regardless of whether the findings are positive or negative. Such transparency supports scientific collaboration and contributes to a deeper understanding of marine ecosystems, ultimately improving conservation strategies. In conclusion, engineers have a fundamental ethical obligation to develop solutions that not only support the recovery of endangered fish species but also promote the long-term health and resilience of marine ecosystems for future generations.

## 6.3 Sales and Marketing Ethics

### ***HERNAN: I WILL CHECK THIS***

The duty of safety and quality assurance requires that all underwater sensors and electrical components are designed and implemented in a manner that ensures they are safe for both users and marine life. This includes minimizing potential risks associated with system failures by incorporating reliable design solutions and protective measures that reduce the likelihood and impact of malfunctions.

The duty of information transparency emphasizes the importance of providing accurate and accessible data. Sensor data should be disclosed in a clear and reliable manner, allowing stakeholders to assess environmental performance and understand the actual impact of the system on sustainability outcomes.

The duty to maximize economic utility involves supporting clients in achieving cost efficiency over time. This includes designing systems that reduce long-term maintenance requirements and operational costs, thereby increasing the overall economic value of the solution.

## 6.4 Environmental Ethics

The project aims to support marine ecosystems while minimizing negative environmental impacts. The artificial habitats are designed to promote biodiversity and contribute to the restoration of natural fish populations without disrupting the surrounding ecosystem.

Material selection prioritizes durability and environmental compatibility in order to reduce pollution and long-term ecological harm. Care is taken to ensure that the structures do not release harmful substances into the marine environment.

The project also contributes to environmental awareness and education by enabling the collection of monitoring data through integrated sensors. This data supports researchers and local communities in developing a deeper understanding of marine ecosystems and the factors that influence their health.

The design considers ecosystem balance, ensuring that the habitat supports species that naturally coexist and avoids introducing elements that could negatively affect the existing ecological structure. This approach aligns with principles of environmental responsibility and sustainable marine management.

## 6.5 Liability

### ***HERNAN: I WILL CHECK IT***

Liability relates to the responsibility for potential consequences if the system does not perform as intended. This includes risks such as incorrect environmental data, failure of monitoring components, or unintended interactions with the surrounding marine environment.

Particular attention is given to the reliability of the monitoring system, as inaccurate data could affect research outcomes and decision-making processes. Ensuring proper calibration, testing, and data validation is therefore essential.

Another aspect concerns responsibility in case of long-term system degradation. Even though the structure is intended to integrate into the environment, it is important to ensure that no harmful elements remain if components fail or deteriorate over time.

Clear documentation and transparency are also part of liability, as they define how the system is used, monitored, and maintained. This helps reduce misuse and ensures that responsibility is properly understood.

## 6.6 Summary

This chapter has examined the ethical and deontological considerations associated with the development of a smart artificial marine habitat. Key aspects included ensuring environmental protection, maintaining data integrity, promoting transparency, and minimizing potential risks related to system deployment and operation.

Based on this ethical and deontological analysis, the team chose a modular habitat design combined with a separable sensor system and durable, environmentally compatible materials such as basalt fiber reinforced concrete. These choices were made to reduce long-term environmental impact, avoid pollution, and ensure that the system can be maintained without disturbing the marine ecosystem.

Consequently, the team decided to design a solution that prioritizes structural stability, safe integration into the seabed, and the ability to retrieve and maintain electronic components independently from the habitat structure. This approach supports responsible engineering practices and reduces potential risks related to system failure and environmental harm.

From:

<https://www.eps2026-wiki4.dee.isep.ipp.pt/> - **EPS@ISEP**

Permanent link:

<https://www.eps2026-wiki4.dee.isep.ipp.pt/doku.php?id=report:eth>

Last update: **2026/04/15 22:01**

