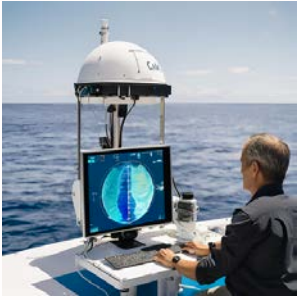# MM7: SDG14 SPACE4SDGS MONITORING OCEAN HEALTH

SDG 14: Space-Based Solution to Monitor and Protect Ocean Health

- Propose a space-based solution to monitor and protect ocean health.

Challenge
The health of our oceans is essential for life on Earth, yet they are under significant threat due to pollution, climate change, and overfishing. The United Nations' Sustainable Development Goal (SDG) 14 aims to 'Conserve and sustainably use the oceans, seas, and marine resources for sustainable development.' This challenge calls you to propose an innovative, space-based solution to monitor and protect ocean health, utilizing satellite technology, remote sensing, and other space-related tools.

Considerations
- You will need to understand how space-based technology, like satellites and drones, can monitor ocean health by detecting changes in sea levels, temperatures, and marine biodiversity.
- What kind of data needs to be collected to inform policies and actions that protect marine ecosystems.
- The solution must address accessibility and ease of implementation for long-term ocean protection.

Background
Our oceans cover over 70% of the Earth's surface and support a massive diversity of life. They are a key source of food, transportation, and climate regulation. However, human activity, such as pollution, overfishing, and greenhouse gas emissions, has caused unprecedented damage to ocean ecosystems, endangering both marine life and human communities. As our understanding of Earth's climate grows, so does our awareness of the importance of real-time data from space to monitor environmental changes.

Space-based solutions offer a unique advantage in observing and protecting vast areas of the ocean that are otherwise difficult to access. Satellite images and sensors can track vital signs of ocean health, such as coral bleaching, plastic pollution patches, and changes in water temperature. Such data not only helps in understanding the current state of ocean ecosystems but also enables informed decision-making to protect these ecosystems and mitigate further damage.

Your Mission
Your mission is to design an innovative, space-based system that can monitor and protect the ocean. Think creatively about how to use technologies like satellites, drones, or remote sensors. How can these tools collect and relay data to benefit scientists, governments, and communities in real time? Consider the types of data most needed to protect ocean health, such as temperature, pollution levels, or biodiversity. Your solution should be feasible, impactful, and support SDG14 by

helping maintain a healthy ocean ecosystem for future generations.

Project Objectives
- Understand and analyse how space technology can be utilised for environmental monitoring.
- Design a creative, feasible, and impactful solution using space resources to monitor ocean health.
- Communicate the impact of their solution on ocean conservation and demonstrate how it supports SDG14.

Deliverables
- Concept Sketches: Visual representations of your proposed solution, including diagrams or storyboards.
- Solution Description: A clear, written explanation of how your solution will work, the data it will gather, and the benefits it will provide.
- User Profile(s): Develop a profile for your intended user(s), including their needs and expectations.
- Presentation: Create a presentation to pitch your idea, explaining the importance of ocean health and how your solution addresses this need using space technology.

Questions to Consider
- What specific ocean health issues could be monitored using space-based tools?
- How will your solution collect data, and how will this data help scientists and policymakers protect ocean ecosystems?
- Who would benefit from this solution, and how could the information be shared in ways that make a real impact?
- What makes your solution unique or innovative compared to existing ocean-monitoring systems?

Design Process Overview

Step 1: Introduction: What is available?
- Explore the challenges facing ocean ecosystems and how satellites can monitor them.

Step 2: Empathy - Who are your users?
- Create user profiles for marine biologists, fishermen, and coastal communities.

Step 3: Defining the Problem
- Define the specific ocean health challenges (e.g., overfishing, coral bleaching, pollution).

Step 4: Ideate
- Brainstorm satellite-based tools for monitoring ocean health (e.g., tracking illegal fishing, mapping pollution).

Step 5: Ideate 2 – Good Idea / Bad Idea
- Iterate on the ideas, exploring real-time data and ways to make information actionable.

Step 7: Test
- Test the system with users like conservationists and marine biologists, adjusting based on their feedback.

Each step will take one or more lessons, your teacher will guide you with lessons and resources from 'Space Design Challenge Problem to Pitch' Module and the Future of Space

The United Nations Office for Outer Space Affairs (UNOOSA) works to promote international cooperation in the peaceful use and exploration of space, and in the utilisation of space science and technology for sustainable economic and social development.

VISIT   https://www.unoosa.org/oosa/en/ourwork/space4sdgs/index.html

Step 1: Introduction: Exploring the problem of ocean health. Research the threats to marine life, from pollution to climate change, and understand how people and ecosystems are impacted.

Visit https://www.unoosa.org/oosa/en/ourwork/space4sdgs/sdg14.html to find out about projects using space technology to monitor and protect ocean health.

Support: Use the resources in MM2,4 and 5 and the Problem to Pitch Space Design Challenge, Lesson 1,

Step 2: Empathy: Understand the needs and experiences of the potential users
Consider interviewing experts in oceanography or space science, or people who rely on the ocean for their livelihoods. Think about why ocean health matters, and who could benefit most from a space-based solution. See additional support p7 for developing your user profiles

Identify Potential Users
- Who would benefit most from access to a tool that monitors ocean data to for ocean health?
- Are you designing this for a specific person e.g. a surfer, an environmental groups or activists, or local policymakers or government?

Daily Challenges and Pain Points
- Describe some of the challenges this individual / group might face regarding ocean health or access to environmental information.
- Outline the challenges individuals or groups faces in accessing, understanding, or using climate data related to ocean health.

Impact on Goals and Daily Life
- Identify what this user needs to simplify their work, make data-driven decisions, or contribute effectively to ocean conservation.
- Describe how the individual would use the proposed solution to achieve their goals and address their challenges
- What positive impact could this data have e.g. providing reliable information on ocean health to make better decisions about activity locations or contribute to ocean conservationformed, data-

Global Benefits and Impacts
- How will your tool help connect users with a broader understanding of ocean health and climate needs?
- In what ways might your tool support action or community initiatives related to ocean health?

Creating User Profiles for a for your proposed solution
After reviewing the SDG14 challenge, your task is to create a user profile for an individual who would benefit from a climate change monitoring dashboard or app. This platform will present critical climate and ocean health data in a user-friendly way, empowering users to make in driven decisions to support ocean conservation and combat climate change. Consider how different users might interact with this tool: it could be a researcher, tudying the effects of climate change on

marine ecosystems, a local government official needing data to shape community policies, or a climate-conscious citizen looking for reliable information to support their ocean advocacy efforts. Defining these user profiles will help you identify the most essential features, data, and user experience elements for your solution.

Step 3: Define - Identify a clear, specific problem within the broader challenge of ocean health that could be addressed using space-based technology.

- Narrow down to a core issue, such as monitoring plastic pollution, tracking water temperature shifts, or detecting illegal fishing. This step will guide the rest of your project by clarifying the purpose and target audience of your solution.

Support: Use the resources in MM7: Problem to Pitch Space Design Challenge, Lesson 3, Refine,

Step 4: Ideate Generate ideas for the layout and features of your tool that will make climate data accessible and engaging.

- How could satellites, drones, or sensors be used innovatively to monitor ocean health? Sketch your ideas, combine different concepts, and explore unique approaches to make data collection more effective and accessible.

Step 5: Refine Choose the most promising ideas from your brainstorming and start refining them into a clear concept.

- Consider the feasibility, impact, and scalability of each idea. Make adjustments to your design based on feedback from peers or teachers, focusing on creating a solution that's practical and impactful.

Support: Use the resources in MM7: Problem to Pitch Space Design Challenge, Lesson 4 and 5, Ideate

Step 6: Build and Validate (Prototype and Test) Create a prototype or model that shows how your solution would work

- This could be a physical model, digital mock-up, or simulation. Test the concept by explaining it to others or through a small trial (if feasible) to see if it addresses the problem effectively.

Support: Use the resources in MM7: Problem to Pitch Space Design Challenge, Lesson 6 Prototype

Prototypes can be 3D or 2D if using wireframes for software / apps. You can read this article to help you https://www.figma.com/resource-library/what-is-wireframing/

Mock-ups can help you imagine how a user might interact with your satellite data -based app or system. The following links in Canva to create prototypes for any platform

- https://www.canva.com/prototypes/templates/
- https://www.canva.com/prototypes/
- https://www.canva.com/prototypes/templates/desktop/

Explore Canva's Mock-up app to show a range of prototypes for different aspects of your programme

Step 5. Refine your ideas by selecting the best solutions for your visual tool

- Focus on ensuring that your visual dashboard or app interface is durable, accurate, and effective in presenting climate data in a clear and accessible way.

- Consider user feedback and prioritise features that make the system user-friendly, sustainable, and resilient against data misinterpretation or technical issues.

Support: Use the resources in MM7: Problem to Pitch Space Design Challenge, Lesson 4 and 5, Ideate

Step 6. Create a mock-up or model of your visual dashboard or app interface
- Display sample climate data relevant to your audience.
- Focus on layout and usability, arranging elements to create a logical, engaging user flow. Include clear navigation and customizable features for accessibility.

Support: Use the resources in MM7: Problem to Pitch Space Design Challenge, Lesson 4 and 5, Ideate

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Creating a Mobile Interface Mock-up for a SDG 14: Space-Based Solution to Monitor and Protect Ocean Health

Open a New Project
- Start by setting up a custom-sized project in Canva (or a similar design tool), with dimensions set to 1080x1920 pixels. This size ensures the design is optimised for a mobile screen, supporting accessibility, readability, and smooth interaction on smaller devices.

Set Up a Mobile Background
- Search for a "mobile screen" frame in the Elements tab, in Canva and place it centrally on the canvas.
- Choose a background colour that's gentle on the eyes, like light blue or grey, to create a calming effect and provide good contrast for text and icons. This helps improve readability and keeps users focused on essential information.

Design the App's Home Screen
- Inside the mobile frame, add a rectangular navigation bar at the bottom of the screen. This bar should provide users with quick access to primary sections, such as "Ocean Health Tracker," "Data Insights," and "Actions," for monitoring ocean data, viewing reports, and engaging in conservation activities.
- At the top, include a circular or square area for the app's icon or logo, making a positive first impression. Add a title like "Ocean Guardian" to welcome users and create a sense of mission.

Add Buttons or Icons for Core Features
- Place large, clear buttons or icons for each main feature, such as "Learn" for educational

resources, "Track" for live ocean health data visualisations, and "Engage" for community forums or expert profiles.

- Label each button with easily readable text. Consider adding alt-text descriptions and audio labels to assist users with visual impairments. Arrange buttons with ample space between them to make tapping easy and to prevent accidental clicks.

Insert a Data Preview Section

- In the centre of the screen, place a rectangular area to serve as a "Data Preview" section, where users can view dynamic updates, such as "Ocean Temperature Trends," "Coral Health Indicators," or "Latest Ocean Conservation News."
- Display this data with a legible font size, and consider adding options for text enlargement or voice narration to enhance accessibility for users with diverse needs.

Use Colours and Borders for Clarity

- Add borders around each button and icon to keep the design organized and visually engaging. Use a colour scheme that aligns with the climate theme, like soft blues, greens, and whites. These colours evoke a connection to nature and ocean health.
- Ensure colour choices are accessible to users with colour blindness by providing high contrast between text and background elements.

Review, Download, and Save

- Review the mock-up for alignment, readability, and user-friendliness, ensuring that icons, labels, and navigation elements are intuitive.
- Verify that the layout feels inviting and that the app encourages exploration. Once complete, download and save the mock-up, ready for feedback or further refinement to meet user needs.

Step 7: Test

- Share your prototype with classmates, teachers, or potential users to gather feedback.
- Ask if the system is user-friendly and intuitive to use, observe how they interact with the tool and what they find challenging or helpful.
- Use their insights to refine the design, making adjustments to improve ease of use, readability, and relevance.

Support: Use the resources in MM7: Problem to Pitch Space Design Challenge, Lesson 7 Test

- Copernicus Marine Service (2024) https://marine.copernicus.eu/
- Copernicus Marine Service (2024) Use Cases https://marine.copernicus.eu/services/use-cases?area=All&country=All&market=All&text=Space
- Faleti, J. (2022) Space in Africa Leveraging Space Technology for SDG-14; Life Below Water
- https://spaceinafrica.com/2022/01/04/leveraging-space-technology-for-sdg-14-life-below-water/
- United Nations (2024) SDG14 Targets and Indicator https://sdgs.un.org/goals/goal14#targets_and_indicators
- UNOOSA (2024) Decent Work and Economic Growth https://www.unoosa.org/oosa/en/ourwork/space4sdgs/sdg14.html
- Quiquet, F. (2021) What are the components of a generic Space System in Space and Cyber Security https://www.spacesecurity.info/wp-content/uploads/2021/11/Components-of-a-space-system.jpg

As you begin to design your solutions, you should consider the types of people who would benefit from or be directly engaged with the project. Here are some prompts to help them think about user-profiles and the needs of individuals who could use their solution:

Young Ocean Enthusiasts and Aspiring Scientists

- Inspiration and Understanding: What would motivate a young person who's passionate about the ocean to work on this project? Consider what information or technology excites them about ocean health and how space-based monitoring could provide unique solutions.
- Clarity and Accessibility: What background information would help a tech-savvy teenager or young scientist understand how space technology works to monitor the oceans? For instance, would simple explanations of satellite technology or case studies on current ocean data systems make the project more engaging?
- Interactivity and Learning: Would incorporating hands-on components, such as mock satellite data analysis or designing a basic sensor, help aspiring scientists feel more connected to the solution? How could this challenge help them feel like they are making a tangible difference in environmental conservation?

Coastal Community Members, Tourism Workers, Fishery Managers

- Community Impact and Relevance: How would this solution help coastal community members who rely on the ocean for their livelihood? What real-time data would be most helpful to them, such as tracking pollution levels, seasonal temperature changes, or overfishing alerts?
- Ease of Use and Accessibility: What tools or platforms would make it easy for these individuals to access the data they need? Could data be shared in real-time through an app, a website, or even SMS alerts?
- Support for Local Goals and Activities: How could access to this information help these individuals make daily decisions? For example, would a fishery manager use the data to determine sustainable fishing days? Could tourism operators adjust activities based on seasonal ocean data?

Researchers and Scientists:

- What specific data would a marine biologist or climate scientist need to study the impact of climate change on the oceans? How would they use this data to inform their research and communicate findings to the public?
- Local Government Officials: What climate-related information would help local government officials make policies for ocean conservation? What types of data could guide decisions on managing coastal areas, protecting biodiversity, or preparing for rising sea levels?
- Climate-Conscious Citizens and Advocates: What information would a citizen need to understand and advocate for ocean health? How would real-time climate data empower them to support environmental policies, raise community awareness, or participate in conservation activities?