



BLUEMISSION AA

Building a coordination hub to support the mission
implementation in the *Atlantic and Arctic Basin*

Market readiness and societal value evaluation frameworks



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Author(s)	Laura Vetter (Fraunhofer)
Contributors	Arne Marchlewski (Fraunhofer), Lorena Iden (Fraunhofer)
Internal reviewers	Valerie de Liedekerke (AIR Centre)

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List of Acronyms

Abbreviation	Full name
3D	Three-dimensional
ARL	Acceptance Readiness Level
BRL	Business Readiness Level
CE	Conformité Européenne (European Conformity)
CRL	Commercial Readiness Level
DoC	Declaration of Conformity
DRL	Demand Readiness Level
DT	decision tree
ESG	Environmental, Social and Governance
EU	European Union
GRI	Global Reporting Initiative
IRL	Investment Readiness Level
IUCN	International Union for Conservation of Nature
KPI	Key Performance Indicators
NANDO	New Approach Notified and Designated Organisation
NbS	Nature-based Solutions
n.d.	Not dated
NGO	Non-governmental organization
PMS	Post-Market Surveillance
R&D	Research and Development
ROI	Return on Investment
SASB	Sustainability Accounting Standards Board
SDG	(UN's) Sustainable Development Goal
SRL	Societal Readiness Level
TAM	Technology Acceptance Model
TRL	Technology Readiness Level
UAT	User Acceptance Testing
UCD	User-Centered Design
UNEP	United Nations Environment Programme
US	United States
USP	Unique Selling Proposition

1. Introduction

The Market Readiness and Societal Value Evaluation Frameworks have been developed to support innovators, businesses, start-ups, and investors in evaluating the readiness and potential impact of marine restoration projects. These frameworks provide a structured approach to self-assessment, addressing the unique challenges in marine restoration and guiding users from initial concept through to commercialization.

At the core of this deliverable is the Evaluation Framework (Chapter 3), a comprehensive decision-making tool that allows users to navigate the complex requirements of marine restoration projects. This framework serves as a systematic method for tracking readiness across technical, market, and societal dimensions, helping users evaluate not only the progress of their projects but also their societal value. In marine restoration—where initiatives must address ecological, regulatory, and social considerations—a clear framework is essential. By establishing specific readiness levels, the framework enables projects to progress through critical stages while ensuring alignment with best practices and regulatory standards.

For stakeholders engaged in sustainable marine technology, understanding market readiness and societal impact is vital for securing investment, gaining community support, and meeting regulatory requirements. The frameworks empower users to assess each phase of their projects with clarity, facilitating effective planning, smoother market entry, and a greater likelihood of long-term success.

Overview of Readiness Levels and Stages

To guide marine restoration projects from idea to sustainable scaling, the frameworks define readiness levels across several key dimensions—demand, technical, business, commercial, regulatory, acceptance, societal, and environmental, social, and governance (ESG) criteria. Each level corresponds to distinct stages in the project lifecycle:

1. **Idea Generation and Validation (Conceptualize):** Early-stage exploration to assess the feasibility and demand for the idea.
2. **Concept Development and Planning (Prototype):** Testing initial concepts and planning for development.
3. **Startup Formation and Development (Develop & Test):** Building the prototype and conducting trials.
4. **Market Entry and Growth (Commercialize):** Introducing the product to the market and driving adoption.
5. **Sustainability and Scaling (Sustain):** Expanding reach, improving scalability, and ensuring long-term success.

Each readiness level offers a set of steps that guide users through these stages with specific milestones, checklists, and case examples in marine restoration, creating a structured roadmap to follow.

Structure of the Deliverable

The deliverable comprises two main components:

1. **Readiness Level Guidelines** offer detailed steps to achieve each readiness level, using marine restoration examples to showcase best practices in project development, regulatory compliance, and societal engagement.
2. **Evaluation Framework** presents a decision-tree tool for self-assessment, guiding users through project milestones with step-by-step prompts, ensuring projects meet essential readiness criteria, reduce risks, and enhance viability.

This framework will be available as an online tool and PowerPoint, making it accessible for both on-site and remote use. It empowers users to systematically assess their projects, prioritize next steps, and measure progress efficiently.

Outcome and Goals

By following these guidelines and using the evaluation framework, users can expect to achieve a well-rounded project readiness. They will be able to identify areas for improvement, prioritize tasks, and align their projects with market needs, regulatory standards, and societal expectations. This deliverable ultimately provides a roadmap for translating innovative ideas into sustainable, market-ready solutions that contribute positively to marine restoration and environmental resilience.

2. Readiness Level Guidelines

This chapter provides comprehensive guidelines for assessing readiness across multiple dimensions critical to the success of marine restoration technologies and initiatives. Each readiness level represents a unique perspective on the development and deployment of sustainable solutions.

Each section details the steps within these readiness levels, offering a clear roadmap from concept to implementation and commercial success. The guidelines include a brief overview, practical HOW to steps for progressing through each stage, and real-world marine restoration examples. These examples illustrate the practical application of each readiness level, showing how projects can address specific needs, meet regulatory standards, secure market acceptance, and contribute positively to environmental, social, and governance objectives. This structured approach aims to equip teams with actionable insights to navigate and advance marine restoration projects through each readiness phase with confidence.

2.1 Demand Readiness Level

The demand for quick, effective, large-scale, and individualized coral reef restoration is anticipated to rise as a result of the increasing degradation of coral reefs driven by climate change (Graf, 2023). The Demand Readiness Level (DRL) is an additional scale to the Technology Readiness Level (TRL). It measures the maturity level of a need's expression by a potential innovator in a specific market, including leading markets focused on eco-innovation. Furthermore, it aims to understand and explain the gap between a technology push caused by TRL and a market pull that features a DRL (Paun, 2011); (Paun, 2012); (Kwon, 2018).

Stage 1: Conceptualize

Step 1: Occurrence of feeling "something is missing"

This is generally an informal, unstructured recognition of a potential need or problem, but without a clear understanding or definition of what exactly is needed or how it might be addressed.

HOW TO

By answering at least one of the following questions with YES, you can uncover informal and unstructured recognition of gaps and unmet needs in ocean restoration, laying the groundwork for deeper exploration and eventual innovation.

1. Are there noticeable changes in the ocean ecosystems that concern you?
2. Are there specific areas or species that seem to be deteriorating despite current efforts?
3. Do local communities and stakeholders say something about the current state of the ocean?
4. Have you heard any recurring complaints or concerns from those involved in or affected by ocean activities?
5. Are there restoration projects or initiatives currently underway, and do they seem effective?
6. Are there areas where current restoration methods seem to be failing or underperforming?
7. Is there anything that frustrates you about the current state of ocean restoration?
8. Do you wish that something could be done differently or better in ocean restoration?
9. Do people informally discuss potential issues or needs in ocean restoration?
10. Have there been any "aha" moments or sudden realizations about missing elements in current practices?
11. Are there any resources or tools you feel are lacking in your efforts to restore the ocean?
12. Are there any ideas or innovations you've come across that haven't been tried but seem promising?
13. Are there any broader environmental or societal impacts being neglected in current ocean restoration efforts?
14. Do you think the future of ocean restoration could be shaped differently by addressing missing elements?

Step 2: Identification of a specific need

At this step, the vague feeling that "something is missing", can be improved, streamlined or made more sustainable evolves into a more concrete understanding of what is required. This could be recognizing a gap in the market, a specific product feature that is lacking, or a particular problem that needs solving. The need is identified but not yet explored or defined in detail.

HOW TO

To delve deeper into identifying these needs, methodologies that offer structured approaches for fostering innovation are employed. This process is often referred to as Design Thinking or User-Centered Design (UCD). Both methodologies focus on understanding and addressing the needs and challenges of users to create innovative solutions. Both approaches involve multidisciplinary teams and stakeholders throughout the process to ensure diverse perspectives and ideas and therefore encourage creative thinking and exploring multiple solutions. Emphasizing an iterative development helps identify potential issues early, reducing the risk of failure.

Design Thinking

Design Thinking is a solution-focused, iterative approach to problem-solving that seeks to understand the user, challenge assumptions, and redefine problems in an attempt to identify alternative strategies and solutions. This approach can be applied to a wide range of challenges beyond just product design, including business strategy, organizational change, and process improvement.

Table 1 Demand Readiness Level: Design Thinking

	Objective	Techniques / Activities
1. Empathize	Understand the user's needs and experiences.	Observation, interviews, empathy maps.
2. Define	Clearly articulate the problem to be solved.	Problem statements, point of view statements.
3. Ideate	Generate a wide range of ideas and potential solutions.	Brainstorming, mind mapping, sketching.
4. Prototype	Create simple, low-cost prototypes to explore ideas and solutions.	Building models, developing mock-ups, creating digital prototypes.
5. Test	Evaluate the prototypes with users to gather feedback and insights.	User testing, feedback sessions, usability testing.
6. Implement	Develop and launch the final product based on the tested and refined prototype.	Detailed design, development, and deployment.

User-Centered Design (UCD)

User-Centered Design is an iterative design process that focuses on the users and their needs, preferences, and limitations at every phase of the design and development process. The aim is to create products that provide a great user experience. **Develop User Scenarios**

Table 2 Demand Readiness Level: User-Centered Design (UCD)

	Objective	Techniques / Activities
1. Understand the User Context	Gain a deep understanding of the users, their environment, and the tasks they need to perform.	Ethnographic studies, user interviews, contextual inquiries, personas.
2. Specify User Requirements	Define and document the user's needs and requirements.	User stories, use cases, task analyses.
3. Design Solutions	Develop design concepts and prototypes that address user needs.	Sketching, wireframing, creating low-fidelity and high-fidelity prototypes.
4. Evaluate Design	Test the prototypes with real users to gather feedback.	Usability testing, A/B testing, heuristic evaluation.
5. Iterate	Refine the design based on user feedback and repeat the cycle.	Continuous testing and refinement until the design meets user needs effectively.

EXAMPLE

An example could be the identification of a specific need for improving coral reef health. This might result from observing declining coral populations and recognizing the need for a solution to enhance coral growth and resilience against environmental stressors. At this level, the specific need (improving coral reef health) is identified, but detailed strategies or solutions to address the need are not yet developed.

Step 3: Identification of the expected functionalities for a new product or service

After recognizing a specific need, the focus shifts to outlining what features the new solution should have to effectively address the identified need. This involves specifying what the product or service should do, how it should perform, and what problems it should solve, thus providing a clearer direction for development and design.

HOW TO

Table 3 Demand Readiness Level: HOW TO identify a new product or service & Example

	Objective	Example
1. Define the Core Objectives	Determine the main purposes of the product or service.	Enhance user convenience, improve efficiency, reduce costs, or increase safety.
2. List Key Functionalities	Outline the primary features that the product or service must have.	For a new app, key functionalities might include user authentication, data synchronization, and notification systems.
3. Determine Performance Requirements	Specify how the product or service should perform under different conditions.	Speed, accuracy, durability, and scalability.
4. Identify Problem-Solving Capabilities	Highlight the specific issues the product or service aims to solve.	Reducing environmental impact, minimizing user errors, or lowering maintenance costs.
5. Incorporate User and Stakeholder Needs	Consider the needs and expectations of users and other stakeholders.	Conduct surveys, focus groups, or interviews to understand their requirements.
6. Explore Innovation and Unique Features	Identify any unique features that could differentiate the product or service.	Integration with emerging technologies, user-friendly interfaces, or advanced analytics.

Table 4 Demand Readiness Level: Action Plan for Identifying Functionalities

	Objective	Techniques / Activities
1. Conduct Stakeholder Workshops	Engage various stakeholders (users, customers, partners, and team members) to gather diverse perspectives.	Use brainstorming sessions to identify potential functionalities.
2. Benchmarking and Research	Study similar products or services in the market to understand best practices and gaps.	Analyze competitor offerings to identify opportunities for innovation.
3. Develop User Scenarios	Create detailed user scenarios and use cases to envision how the product or service will be used.	Map out user journeys to identify necessary features and potential pain points.

EXAMPLE

In the context of marine restoration, an example could be the development of a new artificial reef structure that is designed to support fish populations and promote coral growth. The expected functionalities for this new product might include:

- Ability to attract and provide habitat for various marine species
- Durability and stability in different marine environments
- Eco-friendly materials that do not harm the ocean's ecosystem
- Features that facilitate the growth of coral polyps

Step 4: Quantification of expected functionalities

This step involves setting specific, measurable targets for the functionalities identified in the previous step. Quantifying functionalities ensures clear performance standards and benchmarks, guiding further development and testing. By quantifying the expected functionalities, clear guidelines and standards are established for the development and assessment of the new product or service.

HOW TO

Table 5 Demand Readiness Level: HOW TO quantify expected functionalities & Example

	Objective	Example
1. Set Performance Metrics	Define specific measurements for each functionality.	Durability (years), Speed (transactions per second), Efficiency (energy consumption).
2. Establish Benchmarks	Determine acceptable performance thresholds.	System uptime (99.9%), Response time (under 2 sec), Accuracy (95%).
3. Specify Targets	Set precise goals the product or service must achieve.	Support 1000 concurrent users, withstand waves up to 3 meters, increase biodiversity by 20%.
4. Create Testing Criteria	Develop criteria to test if the product meets the targets.	Load testing for capacity, stress testing for durability, field trials for ecological impact.

EXAMPLE

Returning to the example of artificial reefs, the expected functionalities of the prior step could be quantified as follows:

- Ability to attract and provide habitat for various marine species:
 - Attract at least 20 different species of marine life within the first year.
 - Document the presence of breeding activities within two years.
- Durability and stability in different marine environments:
 - Maintain structural integrity with less than 5% degradation over 5 years.
 - Withstand currents and storms up to certain specified weather conditions.
- Eco-friendly materials that do not harm the ocean's ecosystem:
 - Utilize materials with a 0% toxic release rate.
 - Ensure all materials are sourced sustainably and have a minimal carbon footprint.
- Features that facilitate the growth of coral polyps:
 - Achieve a 40% increase in coral polyp attachment and survival rate within the first 2 years.
 - Design structures to optimize water flow and nutrient availability conducive to coral growth.

Step 5: Identification of system capabilities

This step focuses on understanding and defining the complete set of capabilities the system needs to meet the quantified functionalities from the previous step. It involves analyzing technical, operational, and functional requirements for effective performance. By identifying these capabilities, the system's overall requirements are clarified, guiding detailed design and implementation.

HOW TO

Table 6 Demand Readiness Level: HOW TO identify system capabilities & Example

	Objective	Example
1. Technical Requirements	Identify hardware, software, and technological needs.	Processing power, storage capacity, network infrastructure.
2. Operational Requirements	Define the operational conditions and constraints.	Operating environment, maintenance schedules, user support.
3. Functional Requirements	Outline the specific functions the system must perform.	Data processing, user interface, security features.
4. Integration Need	Determine how the system will integrate with existing systems.	Compatibility with current software, data migration processes, API requirements.

HOW TO

1. Review Expected Functionalities	<ul style="list-style-type: none">• Start by revisiting the quantified expected functionalities from Step 4.• Ensure you have a clear understanding of each functionality and its importance to the overall project.
2. Break Down Functionalities into Sub-Tasks	<ul style="list-style-type: none">• Decompose each functionality into smaller, manageable sub-tasks.• Identify the core actions or processes required to achieve each functionality.
3. Identify Required Capabilities	<ul style="list-style-type: none">• For each sub-task, determine the specific capabilities needed.• Capabilities can include technologies, processes, skills, and resources.• For example, if a functionality is continuous water quality monitoring, the required capabilities might include high-precision sensors, data analytics software, and reliable power sources.
4. Map Functionalities to Capabilities	<ul style="list-style-type: none">• Create a matrix or mapping that links each expected functionality to the corresponding capabilities.• Ensure there is a clear connection between what needs to be achieved and how it can be done.
5. Detail Technical Requirements	<ul style="list-style-type: none">• Specify the technical requirements for each capability.• This includes hardware specifications, software features, operational protocols, and environmental considerations.
6. Assess Resource Needs	<ul style="list-style-type: none">• Identify the resources required to develop and implement each capability.• Resources might include financial budget, human resources, materials, and time.
7. Plan for Integration	<ul style="list-style-type: none">• Ensure that the identified capabilities can be integrated into the existing system or environment.• Consider compatibility with current systems, ease of implementation, and potential risks or challenges.
8. Develop an Implementation Plan	<ul style="list-style-type: none">• Create a detailed plan outlining the steps to develop and deploy each capability.• Assign responsibilities, set timelines, and establish milestones for progress tracking.
9. Validate Feasibility	<ul style="list-style-type: none">• Check the feasibility of the planned capabilities against project constraints like budget, timeline, and technical limitations.• Adjust the plan as necessary to ensure realistic and achievable outcomes.
10. Document and Communicate	<ul style="list-style-type: none">• Document the mapping of functionalities to capabilities and the implementation plan.• Communicate the plan to all stakeholders to ensure alignment and understanding.

EXAMPLE

Table 7 Demand Readiness Level: HOW TO translate the expected functionalities into needed capabilities

Expected Functionality	Needed Capabilities
Ability to attract and provide habitat for various marine species	<ul style="list-style-type: none"> • Design of modular structures that mimic natural coral reef complexity to facilitate diverse species habitation • Selection of materials that are safe for marine life and promote bio-colonization
Durability and stability in different marine environments	<ul style="list-style-type: none"> • Engineering designs that can withstand high wave energy and adverse weather conditions • Use of robust materials tested for long-term degradation in saltwater
Eco-friendly materials that do not harm the ocean's ecosystem	<ul style="list-style-type: none"> • Research and development of sustainable, biodegradable materials • Compliance with environmental regulations and standards for marine construction
Features that facilitate the growth of coral polyps	<ul style="list-style-type: none"> • Incorporation of texture and surface features suitable for coral larval attachment and growth • Development of nutrient distribution systems within the structures to support coral health

Table 8 Demand Readiness Level: Translation of expected functionalities into need capabilities

Step 7: Definition of the necessary and sufficient competences and resources

Here, the focus is on identifying and securing the skills, expertise, and resources required to develop and deploy the capabilities identified in the previous step. This step ensures that the project team is equipped with all necessary tools and knowledge to execute the project successfully. By matching financial, technological, and human resources to the project's requirements, the aim is to ensure that the project is not only theoretically sound but also practically achievable.

HOW TO

- Assessing the skills and knowledge needed among the project team
- Determining the material, technological, and financial resources required
- Planning for the acquisition or development of these competences and resources

Step 8: Identification of experts possessing the competences

Finding and putting together a group of people with the specialized knowledge and abilities required to meet the competencies listed in step 7 is the main goal of step 8. This stage assures that the appropriate human resources comply with the demands of the project. The goal is to create a capable and effective team that can drive the project towards successful completion. For example, competences can be secured by including experts in the team, such as marine biologists, environmental engineers, and project managers.

HOW TO

- Identifying key roles and the specific expertise required for each role.
- Searching for candidates through professional networks, academic institutions, industry associations, and other relevant platforms.
- Evaluating potential team members based on their qualifications, experience, and ability to contribute to the project's goals.

Step 9: Building the adapted answer to the expressed need in the market

The objective of this step is to develop and finalize the solution that directly addresses the needs and requirements identified earlier in the process. This involves integrating all the capabilities, competences, and resources to create a product, service, or system that meets or exceeds market expectations.

HOW TO

- Finalizing the design and specifications of the solution based on feedback and testing results from previous steps
- Ensuring that the solution is scalable, sustainable, and economically viable
- Preparing for implementation, which may include production, deployment, and market introduction.

NOTE: THE FINAL STEP OF THE DEMAND READINESS LEVEL ESSENTIALLY ALIGNS WITH THE ACTIVITIES FOUND IN THE TECHNICAL READINESS LEVEL AND BUSINESS READINESS LEVEL, FOCUSING ON THE DEVELOPMENT AND FINALIZING SOLUTIONS THAT MEET THE MARKET NEEDS.

2.2 Technical Readiness Level

From the conception of an idea to its practical implementation, the Technical Readiness Level (TRL) assesses the maturity of a technological product by applying the necessary indicators to categorize the nine stages of technology readiness (Manotungvorapun, 2021). In the maritime sector, technological advancement is increasingly needed as climate change threatens marine ecosystems like coral reefs (Graf, 2023). New marine technologies actively support environmental monitoring and surveillance, coral and rubble transfer, resilient coral varieties, and data analytics (Gibbs, 2021).

This section outlines the technological development process to support assessments and comparisons of technology maturity.

Stage 1: Conceptualize

Step 1: Study, discover and set basic assumptions

At this initial stage, scientific research is translated into practical insights. Researchers study and discover fundamental properties and principles, forming basic assumptions. This often involves conducting foundational experiments and collecting preliminary data to understand key characteristics and establish a theoretical framework for future development.

HOW TO

1. **Identify Research Objectives:**

Identify the problem, threat or challenge to be addressed. Define the scientific questions and set clear discovery goals.

2. **Conduct Literature Review:**

Review existing scientific literature to understand current knowledge and identify gaps.

3. **Formulate Hypotheses:**

Develop basic assumptions and hypotheses based on the initial literature review and define the theoretical framework guiding your research.

4. **Design Initial Experiments:**

Plan experiments to test hypotheses effectively and investigate fundamental properties.

5. **Collect Preliminary Data:**

Gather initial data through experiments, observations, or simulations, using appropriate methods and tools for data collection, such as sensors or analytical instruments.

6. Analyze Data:

Interpret the preliminary data to understand basic trends and patterns, validate findings with statistical methods and refine your assumptions.

6. Document Findings:

Record all data, experimental setups, and analyses meticulously.

8. Integrate Ecological Knowledge:

Employ continuous multiparametric monitoring methods to collect biological and environmental data.

9. Refine Understanding and Technology Needs:

Use data to improve your understanding and outline technology needs for further development.

10. Review and Iterate:

Regularly review findings, adjusting and refining the research approach as needed.

EXAMPLE

For instance, studies on the fundamental properties of materials might be conducted at this point (Mankins, 1995). Understanding ecological structures is crucial for ecosystem restoration, yet such knowledge is often lacking. Continuous multiparametric monitoring methods that integrate simultaneous biological and environmental data collection for the widest range of species can provide this essential ecological information.

Step 2: Create concepts of technology and/or apply technology formulas

In this stage, researchers create and define practical applications based on the basic principles identified in the previous step. These concepts remain theoretical, as they are not yet validated by detailed analysis or experimental evidence. This step involves the initial design and feasibility assessment of the technology, setting the foundation for future development and testing.

HOW TO

1. **Define the Practical Application:**

Identify how principles from Step 1 can solve specific problems and needs and outline potential applications and use cases.

2. **Develop Initial Concepts:**

Create preliminary designs or models for the technology that address practical constraints and requirements.

3. **Conduct Feasibility Studies:**

Evaluate concepts through theoretical analyses (concept viability evaluation) and simulations or basic models (testing initial assumptions) to refine them.

4. **Identify Technological Approaches:**

Explore and assess different technological solutions and approaches for implementing the concepts and assess the potential effectiveness and practicality of each approach.

5. **Document the Conceptual Framework:**

Record detailed descriptions of the concepts, including theoretical foundations and expected functionalities and prepare documentation that outlines the feasibility and potential impact of the proposed technology.

6. **Plan for Experimental Validation:**

Outline a roadmap for testing and validating concepts in future TRL steps, identifying necessary resources, tools, and methods needed for future experimental analysis.

EXAMPLE

In the context of ocean restoration, Step 2 might involve conceptualizing scalable restoration methods. These methods should be capable of working effectively at fine spatial scales while covering broad reef areas efficiently. For example, researchers might develop a conceptual design for a robotic system that can deploy coral fragments over large areas with minimal human intervention. This system would need to be labor-efficient, reliable, and easy to operate, requiring minimal professional oversight (Gibbs, 2021). During this step, research would focus on creating these concepts and technological approaches before moving to experimental validation.

Step 3: Analyze and experiment core functions and/or prove key elements of the concept

In Step 3 of the maturation process, the focus shifts towards analyzing, experimenting, and proving the core functions and key elements of the concept developed in the earlier stages. This step involves rigorous research and development (R&D) to empirically validate the analytical forecasts and ensure that the technology or concept can perform as expected ("proof-of-concept") (Mankins, 1995).

HOW TO

- 1. Define Objectives and Hypotheses:**

Outline objectives to validate the concept's core functions and formulate hypotheses based on prior analytical forecasts and theoretical foundations.

- 2. Design Experiments:**

Develop a detailed lab plan, selecting appropriate methods and tools. Identify controls and variables for accurate, reproducible measurements. Design analytical studies to contextualize the technology, possibly using simulations, statistical analyses, or comparative studies.

- 3. Conduct Experiments and Data Collection:**

Implement the experiments as planned, using precise instruments and methodologies. Gather empirical data meticulously, ensuring accuracy and consistency. Maintain detailed records of all experimental conditions and observations.

- 4. Analyze Results:**

Analyze the data using statistical and computational tools, identifying patterns correlations, and deviations and validating significance. Compare findings with initial forecasts and place them in the broader context of the field.

- 5. Validate Proof-of-Concept:**

Confirm that the concept's core functions, and key elements work as intended, documenting the entire process, including methodologies, data, analyses, and conclusions.

- 6. Iterate and Refine:**

Use experimental insights to refine and, if necessary, retest the concept to address any discrepancies or unexpected results.

- 7. Prepare for Next Steps**

Compile reports summarizing findings, proof-of-concept validation, and implications, while outlining next steps like scaling up, field tests, or pursuing funding and partnerships.

EXAMPLE

The table below presents specific technologies for marine restoration, offering more detailed examples than the previous step and highlighting opportunities for further development.

Table 9 Technical Readiness Level: Technology required for at-scale reef restoration (Gibbs, 2021)

Reef Restoration	Technology
1. Rubble Stabilisation, Substrate Preparation	Mechanized methods of applying biochemical treatments, physical material handling mechanization.
2. Aquaculture/nursery facilities, collection of wild spawn	In facility material handling and monitoring, larval slick location and harvesting
3. Transport and plant young corals, fragments	Vessels and vehicles to transport and plant young corals, semi-automated methods to identify suitable fine-scale planting locations
4. In-situ Treatments	Vehicles to apply in-situ (underwater) treatments
5. Cooling and shading, predator removal	Physical shading structures, atmospheric modification vessels, underwater vehicles to identify, monitor and eradicate biota.

Stage 2: Prototype

Step 4: Test key components in laboratory conditions

Step 4 focuses on testing key components in controlled laboratory conditions to verify their functionality and identify any issues. This stage ensures the components meet performance expectations and are ready for more complex testing or real-world applications. However, if lab testing is not feasible, move on to Step 5: Conduct an in-situ test, with thorough risk assessments and preventative measures in place to address potential issues.

HOW TO

1. **Identify Testing Environments:**

Select real-world or simulated environments that closely resemble the conditions where the technology will be used.

2. **Design Test Protocols:**

Develop protocols that outline how the technology will be tested in these new environments, including specific conditions and performance metrics.

3. **Implement Testing:**

Conduct the tests according to the protocols, ensuring accurate data collection and monitoring.

4. **Analyze Performance:**

Evaluate the technology's performance in these new settings, comparing it to laboratory results and expected outcomes.

5. **Refine and Iterate:**

Use the insights gained to make necessary adjustments and improvements to the technology before further scaling up.

EXAMPLE

An example of marine restoration technology at Step 4 is experimental oyster reef restoration. At this stage, the technology has already been validated in earlier steps. Now, the key components, such as reef structures and oyster larvae, are integrated and tested together in a controlled lab environment. These tests are conducted in simulated or semi-realistic settings that mimic natural conditions, such as water flow and salinity, to evaluate how well the components work together before moving to real-world application.

Step 5: Extend the key component test from laboratory to other relevant circumstances

Step 5 involves testing the key components outside the laboratory in real-world or simulated environments to evaluate performance under diverse conditions. This step helps to understand how the technology behaves in practical settings and identify any issues that might not have been apparent in controlled lab conditions. By extending testing to these environments, you can assess the technology's reliability, effectiveness, and scalability, making necessary adjustments based on observed performance and environmental interactions.

HOW TO

1. **Develop Models:**

Create detailed models of the core system and subsystems based on previous tests and designs.

2. **Select Testing Environments:**

Choose real-world or simulated environments that accurately represent the conditions where the technology will be used.

3. **Design Test Scenarios:**

Outline scenarios and protocols for testing the models, including conditions and performance metrics.

4. **Conduct Testing:**

Implement the tests, monitoring the performance of both the core system and subsystems in the chosen environments.

5. **Analyze Results:**

Evaluate how well the integrated system and its components perform, identifying any issues or improvements needed.

6. **Refine and Adjust:**

Adjust the system based on test results to improve functionality and integration.

For artificial coral reefs, step 5 would involve testing the reef structures in coastal waters or controlled marine environments rather than just the lab. This might include deploying the reefs in various marine conditions to monitor their impact on local ecosystems, assess their durability, and ensure they provide the intended ecological benefits. Data collected would help refine the reef design and improve its effectiveness in real-world conditions.

Step 6: Test models of core system and subsystems or models in relevant circumstances

Step 6 involves testing models of the core system and subsystems in real-world or simulated environments. This step evaluates how well the integrated system performs under relevant conditions, helps identify potential issues, and ensures that all components work together effectively before moving towards full-scale deployment or commercialization.

EXAMPLE

Artificial reef systems are tested in actual marine environments to evaluate their performance. For example, testing 3D-printed substrates for oyster reef restoration involves deploying scaled-down prototypes in coastal areas. This approach assesses how well the reef structures, coral attachment systems, and artificial fish habitats function under natural conditions, interact with marine life, and endure environmental stresses. The data gathered helps refine the design and functionality of the full-scale reef system, ensuring it operates effectively in real-world settings.

Stage 3: Develop & Test

Step 7: Test prototype in field

Step 7 involves testing the prototype of the technology in real-world field conditions to evaluate its performance, reliability, and functionality outside the controlled environment. This step assesses how the prototype operates under actual usage scenarios and environmental factors, providing critical insights for further development and refinement before full-scale deployment.

HOW TO

1. **Prepare Prototype:**

Finalize and prepare the prototype for field testing, ensuring it is fully functional and representative of the intended design.

2. **Select Field Sites:**

Choose field locations that closely match the conditions where the technology will be deployed.

3. **Design Test Plan:**

Develop a detailed plan for field testing, including specific scenarios, performance metrics, and data collection methods.

4. **Conduct Field Tests:**

Deploy the prototype and monitor its performance, noting any issues or areas for improvement.

5. **Analyze Field Data:**

Evaluate the prototype's performance based on data collected in the field, comparing it to expected outcomes and lab results.

6. **Refine and Optimize:**

Use insights from field tests to adjust and enhance the prototype before scaling up.

EXAMPLE

For deploying an artificial reef, Step 7 would involve placing a full-scale prototype of the reef system in a natural marine environment. This would include monitoring its integration with local marine life, assessing its durability and functionality in varying conditions, and collecting data on its ecological impact. The findings would be used to refine the reef design and ensure it meets performance expectations before larger-scale deployment.

Step 8: Complete product certification

Step 8 involves completing the product certification process to ensure that the technology meets all required standards and regulations for its intended use. This step verifies that the technology is safe, effective, and compliant with industry standards, paving the way for commercial release and widespread adoption.

HOW TO

1. **Identify Certification Requirements:**

Research and understand the relevant standards, regulations, and certifications required for the technology.

2. **Prepare Documentation:**

Gather and organize all necessary documentation, including test results, safety assessments, and technical specifications.

3. **Submit for Certification:**

Apply for certification with the appropriate regulatory bodies or certification agencies, providing required documentation and information.

4. **Undergo Evaluation:**

Work with certifying organizations as they review and test the technology to ensure it meets all standards and requirements.

5. **Address Feedback:**

Make any necessary adjustments or improvements based on feedback from the certification process.

6. **Obtain Certification:**

Secure the official certification, confirming that the technology is ready for commercial use and complies with all relevant standards.

EXAMPLE

For an artificial reef, this step would involve obtaining certification to ensure the reef materials and design meet environmental and safety standards. This might include certifications for ecological impact, material safety, and compliance with marine conservation regulations. Completing this process ensures the reef can be deployed widely and safely in marine environments.

Step 9: Ready to be delivered and used

Step 9 involves finalizing the technology for delivery and use, ensuring it is fully prepared for deployment and operation in its intended environment. This step confirms that the technology is ready for widespread application, having passed all prior tests, certifications, and validations.

HOW TO

1. **Finalize Production:**

Complete any remaining production or assembly tasks, ensuring the technology meets quality and performance standards.

2. **Prepare for Deployment:**

Arrange logistics for distribution and installation, including packaging, transport, and site preparation.

3. **Ensure Support:**

Set up necessary support systems, such as user training, maintenance services, and customer support.

4. **Conduct Final Checks:**

Perform last-minute inspections and tests to verify that the technology is functioning correctly and is ready for use.

5. **Launch Technology:**

Officially deploy and deliver the technology to the end users, ensuring all aspects of the installation and setup are completed.

EXAMPLE

At this stage, marine restoration technologies like coral outplanting techniques and artificial reefs are fully deployed and operational. The widespread use of coral outplanting has proven effective in enhancing coral survival and growth in natural reef settings. This step involves finalizing the structures for deployment, organizing transportation to the installation site, and preparing for placement in the ocean. This may also include integrating new technology into existing systems, setting up support for monitoring and maintenance, and officially launching the reef for marine conservation efforts.

7. **Leverage Mentorship and Incubators:**

Seek mentors for guidance and consider joining incubators or accelerators for resources and networking opportunities.

8. **Document Networking Efforts:**

Keep a record of connections made, including contact details and notes on conversations, to facilitate follow-up.

9. **Review Your Network and Follow Up:**

Assess connections for alignment with your vision and maintain relationships through regular follow-ups to keep them engaged.

plan and conduct crucial business decisions.

Stage 1: Conceptualize

Step 1: Gather people- potential founders and investors- with common interests

At this initial stage, the focus is on building a network of individuals who share a common vision and possess complementary skills to bring the business idea to life. Engaging with the right people is essential for establishing a solid foundation for the venture.

HOW TO

1. **Define Your Business Idea and Value Proposition:**

Articulate your business concept and objectives, highlighting what makes it unique and valuable to attract like-minded individuals.

2. **Identify Required Skills:**

Determine the specific skills and expertise needed for your venture.

3. **Network Within Relevant Communities:**

Attend industry events, conferences, and meetups to connect with potential co-founders and investors (Tengblad, 2023); (Hardouz, 2023).

4. **Utilize Online Platforms and Networking Sites:**

Engage in online communities and social media groups related to entrepreneurship and your industry. Optimize your profiles on platforms like LinkedIn profile to connect with like-minded individuals and expand your reach.

5. **Attend Startup Events and Pitch Competitions:**

Participate in events that attract investors and entrepreneurs. These venues often provide opportunities for pitching ideas and forming partnerships (Tengblad, 2023); (Hardouz, 2023).

6. **Organize Informal Meetups & Collaborate:**

Host casual meetups (coffee, brainstorming sessions) and collaborate on small projects to build relationships and assess teamwork.

HOW TO

1. **Customer Segments:**

Identify the groups or institutions your business aims to serve.

2. **Value Proposition:**

Define the products/services that provide value to each customer segment, considering qualitative (e.g., design, experience) and quantitative aspects (e.g., pricing, speed).

3. **Channels:**

Determine how you'll reach and interact with customers, including communication, distribution, and sales. Channels can be direct or indirect, owned or partnered.

4. **Customer Relationships:**

Define the types of relationships you'll maintain with each segment.

5. **Revenue Streams:**

Identify how your business will generate income from each segment.

6. **Key Resources:**

List the essential elements (human, financial, intellectual, physical) needed for your business model to work.

7. **Key Activities:**

Outline the key tasks required to deliver your value proposition, reach customers, and generate revenue.

8. **Key Partnerships:**

Identify the partners and suppliers critical to your business operations.

9. **Cost Structure:**

Assess the costs involved in executing your business model.

Adaptation for Sustainability:

While the traditional model focuses on operational efficiency and profit maximization, the nature-based approach ensures the company addresses its environmental and social impacts, creating a more holistic and sustainable business model. You may adapt it by including the following:

- **Value Proposition:** Expanded to include the **triple bottom line** (economic, environmental, and social value).
- **Customer Segments:** Reframed as **key beneficiaries** to emphasize the broader impact.
- **Governance:** Added to ensure accountability and transparency in business operations.
- **Revenue Streams:** Focus shifted to **capturing value** beyond financial profit.
- **Cost Structure:** Includes **cost reduction** measures to promote sustainability.

Figure 1 Business Readiness Level: Business Model Canvas adapted from Business Model Generation (Osterwalder, 2017)

HOW TO

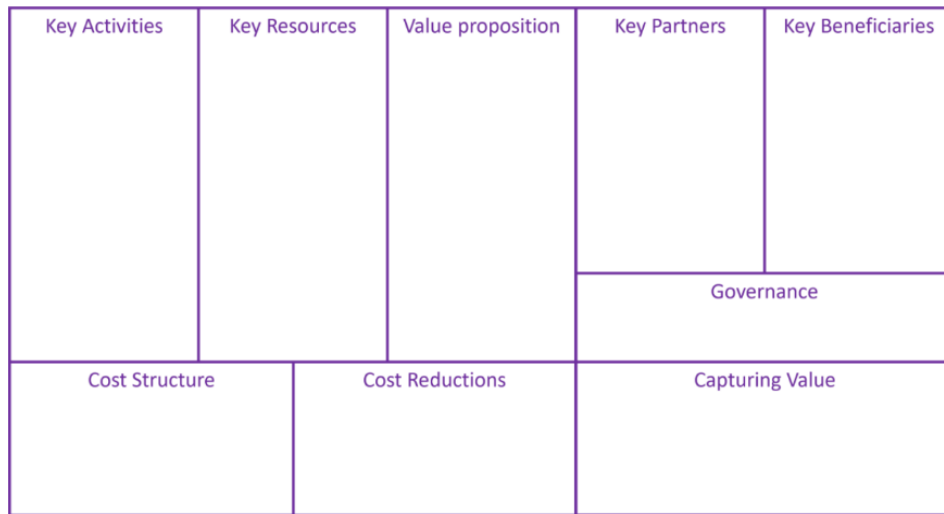


Figure 2 Business Readiness Level: Nature-Based Solutions Model Canvas (Connecting Nature, 2019)

EXAMPLE

In this example “Sustainable Eco-Packaging Startup”, the business is a startup focused on producing eco-friendly packaging solutions, adapting the **Nature-Based Business Model Canvas**.

Key Activities R&D, manufacturing, marketing, and distribution management.	Key Resources Sustainable raw materials, an R&D team, and an efficient supply chain.	Value proposition Economic, environmental, and social value through biodegradable products and awareness-raising.	Key Partners Suppliers of sustainable materials, certification bodies, and eco-friendly logistics providers.	Key Beneficiaries Customers and society at large, benefiting from reduced plastic waste.
Channels Partnerships w/ local governments & environmental groups for distribution in sustainability programs.			Governance Sustainable practices with regular audits and transparency reports.	
Cost Structure Costs include sustainable sourcing, production, marketing, and certification.	Cost Reductions Renewable energy use, reduced waste, and optimized packaging for minimal material usage.		Capturing Value Value is captured via traditional sales, cost savings from reduced material use, and carbon credits.	

Figure 3 Business Readiness Level: Example Nature-Based Solutions Model Canvas

Step 3: Identify forms of self-proposed products and services as well as forms of support seed funding for said products/services

At this stage, businesses must differentiate between those that sell goods or services in a specific market and those that rely on outside funding, like non-profits or organizations implementing nature-based solutions without profit. Businesses must also define how they

interact with nature—whether nature-based solutions are central to their operations or complementary activities. Furthermore, securing seed funding is vital to launch these ventures, with options ranging from angel investors to government grants. By identifying how products and services are framed and seeking appropriate seed funding, businesses in the nature-based solutions sector can establish a solid foundation for long-term success while balancing profitability with positive societal impacts such as food security, coastal defense, and tourism. The core offering is nature-based, positioning the company as one that interacts with nature at the center of its operations.

2. **Identify Your Value Proposition:**

The initiative enhances biodiversity by restoring coral reefs, which leads to greater fish habitat and coastal protection. It also offers significant recreational and tourism opportunities, creating both environmental and economic value.

HOW TO

3. **Value Delivery and Capture:**

1. **Differentiate Product/Service Offerings:**

While customers (tourism operators, coastal communities) benefit from the economic aspects, the broader society gains from environmental and social improvements. For nature-based businesses, clearly define whether nature is central to your operations or a supplementary element. These indirect benefits, such as increased biodiversity and resilience against climate change, need to be communicated effectively.

2. **Identify Your Value Propositions:**

Clearly articulate the economic, social, and environmental value your products or services offer. The business could secure funding through **angel investors** who are passionate about sustainability, **crowdfunding** platforms that attract individuals interested in environmental causes, or **government grants** that support ecological restoration.

3. **Value Delivery and Capture:**

Incubators focused on green tech and sustainable initiatives could also provide early-stage support and mentorship.

5. **Engage with Seed Investors:**

Ensure that your customers and beneficiaries understand the variety of values you provide, from ecological to social benefits. This is crucial, as nature-based ventures often have less tangible value propositions than traditional businesses.

4. **Explore Seed Funding Options:**

In discussions with seed investors, the business emphasizes its long-term value creation—both economically and environmentally—highlighting the patience needed to see results from the restoration efforts. Investigate funding alternatives such as angel investors, venture capital, crowdfunding, government grants, and incubators. Choose the one that aligns with your long-term goals and values.

5. **Engage with Seed Investors:**

When seeking seed funding, emphasize patience and long-term value creation. Seed investors are typically engaged for the long term, shaping your business's direction and strategy.

HOW TO

1. **Identify Key Assumptions:**

Define the core assumptions that your business and revenue models are built on, such as customer demand, pricing, and competition.

2. **Gather Relevant Data:**

Collect data through market research, surveys, and industry reports to verify or challenge your assumptions.

3. **Conduct Experiments or Pilot Projects:**

Test your assumptions by running small-scale experiments, such as pilot projects, limited product releases, or A/B testing different strategies.

4. **Measure and Analyze Results:**

Track and analyze the data from your experiments to determine if your assumptions hold true or need adjustment.

5. **Refine Your Business Model:**

Based on your test results, refine your business and revenue models to align more closely with customer behavior and market realities.

Stage 2: Prototype

Step 4: Test basic assumptions of business and revenue model

After identifying your core product or service and securing initial funding, the next step is to validate your business model. This means testing the key assumptions behind your business and revenue models to see if they hold true in real-world conditions. Testing and experimentation help determine whether your concept is viable, allowing you to refine your approach based on the outcomes. By testing and refining its assumptions, the eco-friendly packaging startup ensures that its business and revenue models are grounded in real customer behavior, ultimately increasing the chances of long-term success.

HOW TO

1. Choose a Valuation Method:

Select an appropriate valuation method based on your company's characteristics. For example, the Berkus Method may be more suitable for early-stage startups, while Discounted Cashflow could work for businesses with predictable future revenue.

Valuation Method	Principle
Berkus Method	Valuation based on the assessment of 5 key success factors
Risk Factor Summation	Valuation based on a base value adjusted for 12 standard risk factors
Scorecard	Valuation based on a weighted average value adjusted for a similar company
Comparable Transactions	Valuation based on a rule of three with a KPI from a similar company
Book Value	Valuation based on the tangible assets of the company
Liquidation Value	Valuation based on the scrap value of the tangible assets
Discounted Cashflow	Valuation based on the sum of all future cash flows generated
First Chicago	Valuation based on the weighted average of 3 valuation scenarios
Venture Capital	Valuation based on the ROI expected by the investor

As an example, the table below presents the modified Berkus Method. For detailed instructions on using the Berkus Method, see [Faster Capital's user guide](#). It emphasizes the company's potential over past performance or current finances, focusing on factors like team quality, business stage, and market opportunities. The method is based on the idea that a start-up is worth the sum of its parts.

Interesting, high potential, attractive idea	\$ 500.000 - \$1.000.000
A good management team	\$ 500.000 - \$2.000.000
Established strategic alliances and market entry barrier	up to \$ 500.000
Prototype completed and tested	\$ 500.000 - \$1.000.000
High quality and advisors board	up to \$ 1.000.000
Product sales and traction formed	up to \$ 1.000.000

2. Assess Key Business Factors:

Evaluate critical components like management team experience, market opportunities, partnerships, and prototype development, which will affect the company's perceived value.

3. Use the Investment Readiness Level (IRL):

Apply Steve Blank's IRL framework to determine the extent of validation of your business model and identify potential risks. This model emphasizes business model validation over valuation and provides a structured pathway to investment readiness (Blank, 2015).

Table 10 Business Readiness Level: Valuation Methods (Nasser, 2016)

4. Engage with Investors:

Once you have determined your valuation and assessed your business readiness, engage with potential investors by presenting your validated business concept, focusing on long-term value creation and risk management.

EXAMPLE

In ocean restoration, determining investment needs could involve calculating the funds required to scale coral restoration projects. Using the Berkus Method, an organization could assign value based on its potential impact, experienced management team, and successful early-stage prototypes of restoration technologies. By reaching a higher level on the Investment Readiness Level (IRL) the company could attract seed funding or venture capital to support large-scale restoration efforts, ensuring long-term viability and scalability (Blank, 2015); (Akkaya, 2020).

The following table presents the standard stages of the IRL by Steve Blank. The initial steps might be adapted to suit different business models or industry segments using different metrics.

Table 11 Business Readiness Level: Modified Berkus Method (Akkaya, 2020)

Stages of the IRL	Marine Restoration Project
1. Complete first pass business model canvas	Identify the core value proposition, such as restoring coastal ecosystems to improve biodiversity and offer eco-tourism opportunities.
2. Market size/ competitive analysis	Assess the potential market for ecosystem services, including government contracts for coastal defense or partnerships with eco-friendly tourism sectors.
3. Problem/solution validation	Test the feasibility of nature-based solutions, such as mangrove planting, by conducting pilot studies to ensure their effectiveness in reducing coastal erosion.
4. Prototype low-fidelity min. viable product	Develop a basic model, such as a simplified restoration technique using low-cost materials, to demonstrate early restoration results.
5. Validate product/market fit	Engage stakeholders like local communities and governments to confirm demand for restoration services, ensuring alignment with their needs (e.g., storm protection).
6. Validate revenue model	Verify revenue streams through potential partnerships or grants from conservation funds, ensuring the project can sustain itself financially.
7. Prototype high-fidelity min. viable product	Enhance the restoration method by incorporating technology (e.g., drones for planting mangroves) to scale the project more efficiently.
8. Validate value delivery	Measure the social, environmental, and economic benefits of the project, such as improved fish stocks, reduced flooding, or job creation in local communities.
9. Identify and validate metrics that matter	Track key performance indicators (KPIs), such as the rate of habitat recovery, carbon sequestration, and community engagement, to continuously assess the project's success.

Table 12 Business Readiness Level: Source: Applying the Investment Readiness Level (IRL) to a Marine Restoration Project based on (Blank, 2015)

HOW TO

To overcome financial obstacles, companies can adopt several strategies:

1. **Public/Private Funding:**

Municipal funding or partnerships with public institutions can help cover initial capital investments, especially for large-scale projects.

2. **Capital Phases:**

Financing should be broken into three key phases—planning, capital investment, and ongoing operational costs. Each phase requires a tailored financial structure, with public sector support often playing a key role in covering initial planning costs.

3. **Community Engagement and Multifunctional Spaces:**

Raising awareness in local communities and integrating multifunctional spaces with environmental benefits (like improved water quality) can attract more financial backers.

4. **Revenue Generation:**

While nature-based solutions often benefit the public, firms should also find ways to generate revenue to cover maintenance costs over time.

Stage 3: Develop & Test

Step 6: Plan and prepare investment and financing

Securing investment and financing is one of the key challenges in upscaling nature-based solutions (NbS) like reef restoration, which improves wave dissipation and protects coastal ecosystems. Solutions addressing biodiversity loss and climate change often require large initial capital investments and long-term operational support (Toxopeus, 2021); (Graf, 2023). Companies implementing these projects must carefully plan and align their financing strategies to match both short-term and long-term objectives, from project planning to ongoing operational costs.

HOW TO

To Prepare for Business Operation and to ensure readiness, companies should follow these key steps:

1. **Finalize Product Development:**

Ensure the core product or service, such as a reef restoration technology, is fully tested and ready for the market.

2. **Optimize Supply Chain:**

Secure reliable suppliers for any raw materials or equipment, and establish efficient logistics systems to deliver goods or services.

3. **Establish Financial and Legal Compliance:**

Ensure proper financial management and adhere to all legal, environmental, and regulatory requirements.

4. **Build Marketing and Sales Strategies:**

Develop comprehensive marketing and sales strategies, including customer targeting and outreach plans.

5. **Form a Strong Team:**

Ensure that a skilled and well-coordinated team is in place to handle operations, sales, and support.

6. **Plan for Customer Support:**

Develop channels for customer service and aftercare to ensure customer satisfaction and manage feedback effectively.

Business operations refer to the activities required for a company to function and generate profit. These tasks vary depending on the sector but often include manufacturing, supply chain management, marketing, finance, and customer service (Baker, 2023). In the context of nature-based solutions, such as reef restoration, they may also involve equipment maintenance, reporting on project progress, and ensuring compliance with environmental regulations. The goal of this step is to ensure that all key operational elements—product development, manufacturing, supply chains, marketing, and finance—are ready before the business enters full market operation.

EXAMPLE

In the context of ocean restoration, preparing for business operations might involve finalizing the development of reef restoration systems, such as coral transplantation technologies, ensuring they are fully functional and market ready. The supply chain would need to be established to source sustainable materials and equipment needed for reef deployment. Financial compliance with environmental regulations would be essential to secure government permits and maintain long-term contracts with coastal regions. The marketing team would develop campaigns targeting coastal communities and tourism operators, showcasing the ecological and economic benefits of restored reefs. Additionally, the company would recruit a skilled team, including marine biologists and environmental engineers, and set up a responsive customer support system to manage client inquiries and provide maintenance services for restored reefs.

5. **Engage with Stakeholders:**

Foster strong relationships with customers, suppliers, investors, and partners to build a sustainable business network.

6. **Measure Success:**

Define and monitor key performance indicators (KPIs) that align with your business goals, such as revenue growth, customer satisfaction, and market share.

A company's long-term success and profitability rely heavily on the viability of its business model. However, in a constantly evolving market shaped by technological advancements, deregulation, and shifting consumer behavior, sustaining a business model is challenging (D'Souza, 2015). Step 8 involves transitioning from planning to actively operating in a competitive marketplace, testing the robustness of the designed business model. This stage also focuses on operational performance and market adaptation, ensuring the business can sustain itself under real-world conditions.

HOW TO

1. **Implement the Business Model:**

Put the designed business model into practice by launching your products or services into the market.

2. **Monitor and Adapt to Market Conditions:**

Continuously track customer preferences, competitors, and industry trends. Be ready to adapt your business strategies as necessary.

3. **Optimize Operations:**

Streamline internal processes to improve efficiency and reduce operational costs. This might involve enhancing production, logistics, or customer service.

4. **Ensure Financial Viability:**

EXAMPLE Regularly evaluate your revenue streams and adjust pricing strategies, product offerings, and cost structures to maintain profitability.

In the context of ocean restoration, operating to ensure the viability of a reef restoration business model could involve launching a coral restoration service on a commercial scale. After gaining initial traction, the company would need to continuously assess environmental outcomes and customer satisfaction, adjusting restoration techniques based on real-time ecological data. Operational efficiency would be optimized by streamlining reef transplantation methods to reduce costs while increasing the scale of restored areas. Financial sustainability could be ensured by developing revenue models such as selling ecosystem credits or partnering with eco-tourism operators. Additionally, key stakeholders, including local communities and governments, would need to be engaged to secure ongoing support and collaboration.

4. Address Regulatory Barriers:

Engage with policy makers and adapt to changing regulatory frameworks, ensuring compliance while lobbying for supportive regulations.

5. Develop Strong Partnerships:

Collaborate with other industry players, academic institutions, and government entities to share knowledge, access resources, and strengthen market position.

6. Invest in Employee Training:

Ensure your workforce is equipped with the necessary skills to adapt to changing market and technology trends.

For a business to thrive, it must navigate internal and external factors that impact its operations.

External elements like market trends, political shifts, and regulations affect success but are often outside the company's control (Graf, 2023). Internally, aspects like technology and organizational behavior are critical for adapting to challenges and seizing opportunities. In the context of marine restoration, a reef restoration business may face challenges such as inconsistent public policy support or lack of financing for large-scale projects. To adapt and remain competitive, the business could invest in smart technologies for more efficient coral transplantation, cutting costs and improving restoration success rates. Additionally, it might collaborate with governmental agencies to align its work with pro-environmental policies, ensuring regulatory compliance and gaining additional support. Addressing social barriers, the business could engage local communities to foster positive attitudes towards marine conservation efforts, thereby improving public perception and attracting further investment. The following table shows numerous drivers and barriers categorized into different dimensions (PESTEL). They include political, economic, social, technological, environmental, and legal aspects. For a comprehensive list of tips and strategies to overcome challenges and adapt to change see [Faster Capital's user guide](#).

Factor	Driver	Barrier
Political	<ul style="list-style-type: none"> - Increased nature-based solution awareness - Policy support 	<ul style="list-style-type: none"> - Inconsistent public policies support - Lack of in-depth understanding - Missing government support
Economic/ Market	<ul style="list-style-type: none"> - Industry networks and collaborations - Partnerships across different sectors - Education and skills 	<ul style="list-style-type: none"> - Financing - Profits are often long-term and rather savings than actual profits - Missing awareness of nature-based solutions in private sector - Benefits are scattered between different stakeholders - Lack of capacities of workers - Lack of trained local workers
HOW TO		
1. Assess Internal and External Factors:	<p>Continuously monitor and assess both internal conditions to identify emerging risks and opportunities to grey infrastructure</p> <p>Availability of funding instruments</p> <p>Cost savings for nature-based solution in comparison to grey infrastructure</p>	
2. Innovate and Improve Technology:		
Social	<p>Invest in new high media/public interest</p> <p>Operational Collaboration with academia</p> <p>Engagement of local communities in the business</p> <p>Adjust the business model to reflect market needs, cost efficiency, or customer service.</p>	<p>Disparities in awareness across sectors</p> <p>Negative attitude of local communities</p> <p>Gap between science and practice</p>
3. Adapt Business Model:		

Factor	Driver	Barrier
Technological	<ul style="list-style-type: none"> - Smart technologies - Technological advancements leading to adaptation to changing environmental conditions 	<ul style="list-style-type: none"> - Evidence of effectiveness of nature-based solutions - Measuring impact of nature-based solutions
Environmental	<ul style="list-style-type: none"> - Climate change as driver of awareness - Resource scarcity awareness - Extreme weather events emphasizing urgent adaptation needs - Increasing public perception of sustainability's importance 	<ul style="list-style-type: none"> - High risks of restoration projects - Potential environmental degradation due to resource extraction - Increased regulatory requirements for environmental compliance - Potential reputation risks for failing to meet sustainability expectations
Legal/ Regulatory	<ul style="list-style-type: none"> - Pro-environmental policies, planning, and regulatory instruments - Changing accounting frameworks 	<ul style="list-style-type: none"> - Inconsistent regulation - Lack of industry standards - Lack of enforcement of environmental regulations

Table 13 Business Readiness Level: PESTLE Drivers and barriers based on research based on (Graf, 2023)

3. **Form Strategic Partnerships:**

Collaborate with beneficiaries, customers, and industry stakeholders to strengthen market presence.

4. **Focus on Efficiency:**

Continuously enhance the efficiency of restoration processes or product delivery to remain competitive.

5. **Adapt to Market Trends:**

Stay ahead of market changes by innovating and adopting new technologies that improve service offerings.

6. **Build a Strong Brand:**

Develop a reputation for high-quality solutions and thought leadership within the industry.

Beneficiaries and strong relationships with environmental partners is essential for long-term success, especially in industries like maritime restoration.

HOW TO

1. **Strengthen Internal Capabilities:**

Invest in hiring skilled employees, especially in marketing, business planning, and innovation.

2. **Diversify Value Propositions:**

Offer a range of solutions that address environmental and social concerns while providing long-term financial benefits to customers.

EXAMPLE

A company engaged in coral reef restoration could focus on increasing the efficiency of coral propagation techniques to scale up operations. By forming strategic partnerships with environmental organizations and local governments, the company can improve visibility and become a go-to provider for large-scale restoration projects. It could also enhance its brand by showcasing successful projects that deliver both environmental impact and cost savings to stakeholders, positioning itself as an industry leader.

HOW TO

1. **Create Supporting Products:**

Develop complementary products or services that enhance the core offering, ensuring relevance in the market.

2. **Rebranding:**

Refresh the brand to appeal to evolving customer preferences or market trends, keeping the business competitive.

3. **Analyze Market Demand:**

Regularly assess the demand for your products or services and adapt accordingly to avoid stagnation.

4. **Recognize Growth Costs:**

Understand the costs behind scaling and ensure the financial health of the business through careful investment planning.

5. **Select a Growth Strategy:**

Choose the most appropriate growth strategy based on the company's current position, such as market penetration, diversification, or strategic partnerships.

EXAMPLE

A company specializing in marine restoration could introduce supporting services such as environmental impact assessments or consulting on ecosystem services. By rebranding to emphasize innovative restoration techniques and analyzing trends in eco-conscious investments, the company can appeal to a broader range of clients. Furthermore, by continuously assessing market needs and adapting its service offerings, the company can sustain growth in line with the industry average, maintaining relevance and profitability over time.

EXAMPLE 2.4 Commercial Readiness Level

The commercial readiness level (CRL) represents the progress of marketing initiatives, including market research, product introduction, and target customer segmentation analysis and market research in general (Mangunsoyo et al., 2021). The process involves iterative prototyping and to change the way that restoration is seen, approached, and reported. This section emphasizes the need of comprehending various viewpoints on commercial operations for businesses that feature marine restoration as their core activity (McAfee, 2022) (Graf, 2023). Thus, this section serves as a guideline for companies to gain readiness for the commercial application of their products or services related to the protection and restoration of ocean and freshwater ecosystems.

Stage 1: Conceptualize

-

Stage 2: Prototype

Step 1: Determine basic commercial assumptions e.g. target customers

The first step is to develop an initial understanding of the commercial opportunity for your product, process, or solution. Since market knowledge is limited at this stage, companies should begin by assessing feasibility using tools like market research, customer segmentation, and customer profiling. These activities will help determine key assumptions such as target customer groups and market potential (Granted Consultancy, 2021).

HOW TO

1. Conduct Market Research:

Gather data on industry trends, market gaps, demand forecasts, and potential competitors. Use industry reports, feasibility studies, and expert insights to identify commercial opportunities and the market landscape (Sari, 2016).

2. Customer Segmentation:

Break down potential customers into distinct groups with shared characteristics. Segmentation criteria may include demographic, geographic, psychographic, or behavioral factors (Hassan, 2018). Customer segmentation helps identify patterns and preferences that influence purchasing behavior.

3. Data Collection:

Gather the corresponding customer data that comprises transactional history, demographic information, and promotional responses. Collect both primary data (from surveys, interviews, or focus groups) and secondary data (from public databases, marketing companies, or academic research) (Curtis, 2018).

4. Analyze and Profile Customers:

Use statistical analysis to create detailed customer profiles and identify high-value segments. Analytical methods like cluster analysis or regression models can highlight the most profitable or loyal customers (Hassan, 2018).

Step 2: Identify unique selling proposition for commercial viability

After defining your target market, developing a Unique Selling Proposition (USP) is the next step. A compelling USP clearly communicates a key benefit that sets your product apart, driving customer purchase decisions (Reeves, 1961); (Niu, 2016). This is especially relevant in industries like maritime restoration, where both environmental impact and economic value play significant roles in decision-making. Businesses need a USP that highlights why their offering is better suited to solving a particular problem than competitors' solutions.

HOW TO

1. Analyze Market & Competitors:

Review competitors' offerings to understand how they position themselves. Analyze customer feedback and industry trends to pinpoint gaps or areas where your service can stand out.

2. Define Core Value Propositions:

Develop a list of value propositions that address the main benefits your product or service offers. Categorized the list across economic, environmental, and social dimensions. Provide clear economic reasons for customers to purchase and highlight environmental impacts, alongside social benefits.

EXAMPLE

A marine restoration startup positioned itself with a strong USP around "improved restoration efficiency" and "accelerated project timelines." After analyzing competitors, the company found that most restoration firms promote lengthy recovery periods for marine ecosystems. The startup on the other hand developed an innovative method that accelerates coral growth, leading to quicker reef recovery and cost savings for clients.

The company also emphasizes the environmental value of its services, such as creating new coral habitats that protect shorelines from erosion and restoring marine biodiversity. By packaging this with impact communication services, the startup allows private companies to feature these initiatives in their sustainability reports, aligning with corporate social responsibility goals. Thus, they create a well-rounded USP that differentiates their offering from others in the market.

Stage 3: Develop & Test

Step 3: Analyse details of target market and pricing strategy

In this step, companies refine their understanding of the target market and determine an appropriate pricing strategy. A pricing strategy outlines the methodology a business uses to price its goods or services, ensuring costs are covered and a sustainable profit margin is achieved (Sammut-Bonnici, 2015). The pricing method should align with market demand, competitive positioning, and the company's overall goals. This is particularly important in nature-based solutions, where pricing models must reflect both economic and environmental value.

HOW TO

1. Analyze Target Market in Detail:

Before setting a pricing strategy, analyze the target market by segmenting customers based on demographics, behaviors, and needs. Understand audience motivations—such as cost savings, sustainability, or aesthetics (Graf, 2023).

2. Establish Pricing Objectives:

Set pricing objectives focusing on maximizing profit, growing market share, or ensuring sustainable returns for ecosystem restoration (Smit, 2014).

3. Choose Pricing Strategy:

Choose one of the following approaches, or a combination of both.

- **Cost-based pricing:** Pricing is based on the total costs of production, including both capital and operational expenses, with an added profit margin (Bayraktarov, 2016).
- **Competition-based pricing:** Pricing is set in relation to competitors' prices for similar services or products (Sammut-Bonnici, 2015).

4. Factor in Social and Environmental Aspects:

Include social aspects, such as local stakeholder engagement, and environmental impact into the pricing strategy to reduce risks and increase efficiency, attracting investors and local support (Graf, 2023).

EXAMPLE

A coral reef restoration company conducted market research to understand the motivations of its customer segments. Local governments valued environmental impact, while private-sector companies prioritized economic benefits like faster restoration and inclusion in sustainability reports. The company set pricing objectives to balance economic viability with long-term sustainability.

To address these groups, the company adopted a cost-based pricing strategy, calculating restoration costs per hectare between US\$80,000 and US\$1.6 million, covering capital and operational expenses (Bayraktarov, 2016). For stakeholders focused on social benefits, the company highlighted community engagement and education in coral planting initiatives, creating a value-added pricing tier for clients who prioritized social impact.

Step 4: Test market acceptance and market concept

Testing market acceptance and the proposed market concept is crucial for determining the viability of a product or service. This step encompasses understanding socio-political, community, and market acceptance dimensions, each playing a significant role in how a restoration service or product will be perceived and utilized. By assessing these aspects, businesses can identify potential challenges and opportunities before a full market launch, ultimately improving the chances of success in a competitive environment (Peñaloza, 2022); (Bayraktarov, 2016).

HOW TO

1. **Assess Socio-Political Acceptance:**

Evaluate socio-political acceptance by understanding how policies shape the market. Engage with policymakers to ensure alignment with regulatory frameworks and ecological offset policies that support ecosystem restoration (Peñaloza, 2022).

2. **Evaluate Community Acceptance:**

Focus on community acceptance by identifying and addressing local stakeholder needs. Engaging marine and coastal sector businesses during planning and implementation (Danovaro, 2021).

3. **Determine Market Acceptance:**

Analyze the distribution of costs and benefits among stakeholders. Assess how restoration initiatives impact well-being, climate, biodiversity, and economic growth. Communicating the long-term benefits of restoration is crucial for securing stakeholder support (De Groot, 2013); (Danovaro, 2021).

4. **Conduct Market Concept Testing:**

After assessing the three acceptance dimensions, test the market concept in a focused segment by launching a pilot project. Gather feedback from the target market to evaluate feasibility and desirability. Promote continuous engagement (Qualtrics, 2023).

EXAMPLE

A coastal restoration company aimed to enhance market acceptance by engaging local policymakers to align their project with ecological offset policies. This advocacy helped secure supportive regulations for their initiatives.

They then held community workshops with local stakeholders, such as fishing businesses and environmental NGOs, to gather insights and strengthen community acceptance.

To address market acceptance, the company communicated the project's potential benefits, like improved fish stocks and tourism opportunities, while addressing cost concerns. Finally, they launched a pilot restoration project in a specific coastal area, collecting feedback from local residents and businesses. This ongoing communication allowed them to adapt their approach based on real-time input, ensuring the restoration service was well-positioned for a successful full-scale launch.

Step 5: Prepare for commercial operation

Preparing for commercial operation involves setting up a systematic process to convert inputs into valuable outputs for customers. This step is crucial for ensuring that all business elements are aligned and ready for a successful market launch. Key aspects include finalizing business plans, financial management, legal compliance, and marketing strategies, as well as building a competent team and establishing customer support systems. Understanding both drivers and barriers is essential to navigate the challenges of launching a business effectively.

HOW TO

1. **Finalize Business Plan:**

Review and update the business plan, ensuring that it includes a detailed operational strategy, financial projections, and risk assessment.

2. **Financial Management:**

Set up a robust financial management system that covers budgeting, accounting, and cash flow management to ensure financial stability.

3. **Legal and Regulatory Compliance:**

Ensure that all necessary permits and licenses are obtained, and that the business complies with relevant regulations in the restoration sector.

4. **Team Building:**

Assemble a skilled team with the expertise needed to execute the operational plan, ensuring clear roles and responsibilities.

5. **Marketing and Sales Strategy:**

Develop a comprehensive marketing and sales strategy to promote the restoration services effectively and reach the target audience.

6. **Customer Support:**

Establish a customer support system to handle inquiries, feedback, and concerns, ensuring a positive customer experience.

7. **Identify Drivers and Barriers:**

Assess the drivers and barriers that could impact operations.

EXAMPLE

A coral restoration company is preparing for commercial operations by finalizing its business plan, including a financial forecast for initial funding and ensuring compliance with environmental regulations by obtaining necessary permits. They build a team of marine biologists and project managers with clear roles to enhance efficiency. A marketing campaign promotes their services, emphasizing the ecological benefits of coral restoration to attract local communities and the tourism sector. Finally, they establish a customer support system to address inquiries and ensure smooth communication. The company identifies drivers, such as increased climate change awareness, while addressing barriers like financial backing and regulatory support for a successful launch.

Stage 4: Commercialize

Step 4: Deliver commercial applications

To scale operations, they invest in additional equipment and staff for larger restoration projects. A marketing campaign featuring success stories and testimonials is launched to showcase service effectiveness. Throughout this process, the company continuously refines market assumptions and adapts its strategies for a successful full-scale launch. At this stage, businesses have completed the customer qualification process, confirming that their offerings meet the needs of their intended audience. To ensure successful scaling and growth, companies must continuously refine their market assumptions and prepare for a full-scale launch of their product.

HOW TO

1. **Finalize Product Development:**

Ensure that the product or service is fully developed, tested, and ready for market. This includes addressing any remaining quality assurance issues.

2. **Implement Sales Strategies:**

Utilize the established business model and route-to-market strategy to begin selling the product. Train sales teams on product features and benefits to enhance their effectiveness.

3. **Monitor Market Dynamics:**

Continuously review market assumptions and customer feedback to adapt strategies as needed. This can involve collecting data on sales performance, customer satisfaction, and competitor activity.

4. **Scale Operations:**

Develop plans for scaling production and sales to meet demand. This may involve optimizing supply chains, hiring additional staff, or investing in new technologies.

5. **Launch Marketing Campaigns:**

Initiate targeted marketing campaigns to raise awareness and generate interest in the product. Utilize various channels, such as social media, email marketing, and events, to reach potential customers.

6. **Gather Feedback and Validate Assumptions:**

Collect feedback from customers to evaluate the effectiveness of the product and marketing strategies. Use this information to refine offerings and strategies further.

EXAMPLE

A marine restoration company has qualified its target customers and is ready to deliver services. They finalize their restoration technology, ensuring it meets industry standards through rigorous testing, and train the sales team on the unique benefits of their service, highlighting its efficiency and environmental impact.

The company then implements sales strategies, launching an outreach campaign targeting local governments, NGOs, and sustainability-focused businesses. They monitor market dynamics by gathering customer feedback and tracking sales data to refine their approach.

EXAMPLE

A marine restoration company has established its services within a local community and recognizes the potential for growth by targeting larger clients, such as government agencies and corporations focused on sustainability. Analyzing its customer base, the company identifies the public sector as a key segment capable of funding significant restoration projects.

Step 7: Plan for making competitions and scale up customer base

To scale operations, the company introduces a subscription model that includes ongoing monitoring and maintenance services, ensuring a consistent revenue stream for business. The company also forges partnerships with NGOs, scaling up operations for maintaining credibility and bases on the market for size and market growth. This strategic decision impacts how the company will engage with the economic value of projects, investing governmentally expanding private sector base with government budgets. A well-planned approach to expanding the customer base ensures sustained revenue growth and market presence (Graf, 2023).

HOW TO

1. **Assess Target Market Segments:**

Identify potential customer segments that can be targeted for expansion, including local communities, government bodies, NGOs, and large corporations.

2. **Determine Growth Strategy:**

Decide whether to scale up operations or maintain a local focus, considering the company's resources, capabilities, and demand in the target market.

3. **Implement a Subscription Model:**

Adopt a subscription model for services (e.g., restoration as a service) can provide stable cash flow and customer engagement, including monitoring and maintenance.

4. **Develop Strategic Partnerships:**

Form alliances with public and private sector stakeholders to leverage larger projects and funding opportunities enhancing credibility and provide access to new markets.

5. **Enhance Marketing Efforts:**

Launch targeted marketing campaigns that emphasize the unique environmental and economic benefits of your services. Tailor messages to resonate with various customer segments.

6. **Gather Feedback and Adapt Strategies:**

Continuously collect feedback from customers to refine services and adapt marketing strategies, ensuring alignment with customer needs and preferences.

5. **Focus on Restoration Efficiency:**

Prioritize improving the efficiency of restoration efforts as a key value proposition. Effective restoration processes can attract customers and improve project outcomes.

6. **Implement a Restoration Reporting Framework:**

Establish a reporting framework to measure and communicate the impact of restoration activities, demonstrating the value of your services to stakeholders and enhancing credibility.

Stage 5: Sustain

Step 8: Create business extension to gain more commercial benefits

Creating business extensions is essential for companies in the marine restoration sector to achieve growth and maximize commercial benefits. By enhancing internal capabilities, investing in skilled personnel, and engaging key stakeholders, businesses can diversify their offerings and strengthen their market position. A well-defined strategy for business extension includes developing diverse value propositions that deliver long-term economic, environmental, and social benefits to customers (Graf, 2023).

HOW TO

1. **Enhance Internal Drivers:**

Focus on improving internal processes and systems that can be influenced to boost efficiency and effectiveness in operations.

2. **Invest in Skilled Employees:**

Recruit and develop employees. A knowledgeable workforce is crucial for driving growth and innovation.

3. **Identify and Engage Key Beneficiaries:**

Identify potential customers and strategic partners who can benefit from your services to foster collaboration and enhance value creation.

4. **Develop Diverse Value Propositions:**

Create a range of offerings that address different customer needs, emphasizing the economic, environmental, and social benefits of your services.

EXAMPLE

A marine restoration company aiming for growth realizes the importance of enhancing its internal capabilities. It invests in skilled employees with expertise in business strategy, marketing, and restoration practices, allowing for more effective outreach and engagement with potential clients.

The company identifies local governments and NGOs as key beneficiaries of its services, actively involving them as both customers and strategic partners. By emphasizing the diverse value propositions—such as improved restoration efficiency, environmental impact, and community engagement—the company successfully appeals to a broader audience.

To further strengthen its market position, the company implements a restoration reporting framework:

1. Environmental Impact Metrics:

Tracks measurable ecological restoration outcomes, like coral survival rates and biodiversity improvements. For instance, a company may report enhanced water quality post-restoration.

2. Social and Economic Outcomes:

Highlights social benefits such as increased eco-tourism and reduced coastal erosion, contributing to local economies.

3. Transparency and Accountability:

Provides data-driven reports for transparency, demonstrating restoration progress to authorities and stakeholders, ensuring credibility.

4. Data Collection and Monitoring:

Ongoing monitoring to track ecosystem health, like fish population growth, allowing for continuous improvement of techniques.

5. Marketing and Investor Communication:

Used to attract investors by demonstrating restoration's economic and environmental benefits, like increased tourism and risk reduction.

6. Scalability and Standardization:

Applies consistent metrics across regions, aligning projects with global sustainability goals.

EXAMPLE 2.5 Regulatory Readiness Level

Even with a high level of technology, companies can face market entry risks from insufficient regulatory support (Kabane, 2018). The European Commission created a digital industrial package and strategies that create a regulatory framework to protect and restore pre-assignment freshwater ecosystems. These regulations encourage adopting new technologies by promoting safer alternatives, facilitating secure market entry (Kabane, 2018). Stricter environmental regulations that consider regulations early in the innovation process is crucial; without them, innovations may fail to enter the market, leading to delays. Leveraging existing regulations can provide a safer, but potentially less innovative pathway, necessitating a careful evaluation at the start. These guidelines assist companies in assessing the regulatory readiness of their products or services related to ocean and freshwater ecosystem protection and restoration, focusing on EU regulations. Note that these guidelines do not apply to medical products, which require a more comprehensive approach.

Stage 1: Conceptualise

Step 1: Define and Review the Target Market of the Innovation/Technology

Defining and reviewing the target market is crucial during the conceptualization phase of any product, service, or innovation. This understanding helps identify relevant regulations and needs the technology or application must address. It ensures alignment with regulatory frameworks and market expectations, which can vary across countries and communities. Regulatory considerations significantly influence the feasibility and acceptance of innovations, especially in sensitive sectors like marine restoration, biotechnology, and energy.

HOW TO

1. **Identify Market Segments:**

Understand market segments to identify potential customers and their regulatory needs, as different segments may face varying regulations and industry standards.

2. **Assess Regulatory Landscape:**

Examine existing regulations that affect your product's market entry and compliance requirements (Stendard, n.d.)

3. **Analyze Market Demand:**

Understand customer needs and preferences can help assess regulatory implications. Certain market demands may necessitate adherence to specific regulations.

4. **Evaluate Ethical Considerations:**

Consider ethical aspects that shape regulations. Societal values can drive the acceptance and implementation of regulations (Felt, 2015); (Jasanoff, 2009).

5. **Review Competitive Landscape:**

This aspect is less directly related to regulatory readiness but can provide context for how competitors navigate regulatory challenges, influencing your strategy.

6. **Explore Future Markets:**

Raise awareness of regulatory differences across regions.

5. **Set Goals and Milestones:**

Establish clear objectives and milestones, along with a timeline for achieving them. This structured approach helps maintain focus and allows for necessary adjustments.

6. **Regularly Review the Strategy:**

As regulations, especially for new products, can change rapidly, it's vital to review and update your regulatory strategy regularly to ensure alignment with the current regulatory landscape (Salvatore, 2023).

Step 2: Review and agree on the classification and regulatory strategy

Defining and reviewing the target market is critical for establishing a robust regulatory strategy for any innovation or technology. A well-structured regulatory strategy outlines the necessary regulatory pathways throughout the product lifecycle and aligns these with broader business objectives (Oppenheimer DS, 2022); (Stendard, n.d.). Understanding the target market helps identify specific regulatory requirements, anticipate costs, and streamline the path to market approval, thereby minimizing risks and enhancing the likelihood of success.

HOW TO

1. **Set the Market and Understand Regulatory Variations:**

Identify the primary markets for your innovation. Be aware that regulations can differ significantly across regions and countries, with unique standards for your product.

2. **Gather Comprehensive Information Early:**

Collect essential data about your product, including a detailed product description, target countries, technical documentation, and existing approvals. Early information gathering can mitigate future costs and risks (Salvatore, 2023).

3. **Determine Approval Procedures:**

For each target market, ascertain the potential approval procedures and identify specific regulatory requirements. This understanding will aid in determining the necessary documentation and testing for compliance.

4. **Assess Risks:**

Evaluate the potential risks associated with regulatory approval based on prior experiences and assumptions. Consider factors such as time delays, costs, and the likelihood of approval.

HOW TO

1. **Define the Intended Use:**

Outline the product's main function, primary application, problem solved, and target users to support regulatory filings. Define whether the technology is aimed at environmental restoration, industrial efficiency, or another purpose, ensuring the intended use complies with relevant industry regulations.

2. **Establish Key Performance Indicators (KPIs):**

Identify measurable KPIs that demonstrate the product's success in its intended use to ensure the product meets legal standards. These should be quantitative metrics, like performance levels, environmental impact reductions, or efficiency improvements, tailored to the product's functionality and regulatory expectations. KPIs.

3. **Align KPIs with Regulatory Requirements:**

Ensure the KPIs are relevant to customer needs and comply with industry-specific regulatory standards. In the marine restoration sector, for instance, regulators might require performance metrics around biodiversity restoration or ecosystem health.

4. **Test and Validate Performance:**

Conduct controlled testing to verify the product meets its intended use and achieves the established KPIs. This involves rigorous trials, including stress tests, to ensure functionality under various conditions. Such data demonstrates the product's reliability in delivering its intended purpose for regulatory approval.

5. **Document for Regulatory Submission:**

Prepare detailed documentation of the intended use and performance tests. Regulatory bodies need thorough records that support the product's claims. This documentation should clearly state how the product meets the regulatory guidelines and why it's fit for its intended market.

6. **Review and Adjust if Necessary:**

Make necessary adjustments to the product design or intended use, if testing reveals discrepancies between the intended use and actual performance.

EXAMPLE

A company developing a seagrass restoration technology defines its intended use as the "restoration of coastal seagrass ecosystems to improve water quality and enhance biodiversity." The company establishes key performance indicators, such as the percentage of seagrass coverage restored within a year, reduction in water pollution levels, and the number of marine species returning to the restored habitat.

The device undergoes field tests to validate these KPIs, and the results are documented. The company submits the documentation to the appropriate regulatory body, demonstrating that the device can perform as intended, comply with environmental regulations, and achieve the desired outcomes in its target market.

Step 4: Plan of required regulatory submissions and establish implementation plan in compliance with applicable regulatory requirements

Planning for regulatory submissions is crucial for ensuring that your product complies with all applicable regulations throughout its lifecycle. A well-structured submission plan helps streamline the approval process, identifies potential challenges early, and ensures alignment with regulatory standards and the necessary documents. These documents include safety assessments and efficacy studies for the product's approval. The company then creates a submission plan, setting a timeline to submit documents well in advance of the product launch to account for potential delays. They allocate a team with expertise in regulatory affairs to manage the process and establish a tracking system to monitor submission statuses.

By proactively addressing regulatory requirements, including complying with **EU harmonized standards**, the company positions itself for smoother market entry. These standards enhance transparency and simplify the approval process across EU member states (European Commission, Product compliance, 2024).

HOW TO
To introduce a product or service on EU-markets, the [EU Product Compliance Overview](#) is helpful to meet the regulatory requirements.

Identify Required Regulatory Submissions:
The following screenshots show an example of introducing algae for human consumption on the EU market:

Research and compile a list of all regulatory submissions needed for your product in each target market. This may include pre-market notifications, registration

Access2Markets

Home Goods Services Investment Markets Toolbox Contact

Single Entry Point for Trade Barriers

My Trade Assistant
Goods + ROSA (Rules of Origin Self-assessment tool)

How to use this form Disclaimer

Product name or HS code: algae Country from: Japan Country to: Belgium Search

Create a detailed timeline for your regulatory submissions. This should include each phase of the approval process, ensuring that all necessary

Access2Markets - Home

Seaweeds and other algae 12 12 210000 - 290000 Show in list of goods

Vegetable products > Oil seeds and oleaginous fruits; miscellaneous grains, seeds and fruit; industrial or medicinal plants; straw and fodder > Locust beans, seaweeds and other algae, sugar beet and sugar cane, fresh, chilled, frozen or dried, whether or

Access2Markets - Search

Seaweeds and other algae 12 12 21 00 00 - 29 00 00

Fit for human consumption 12 12 21

Access2Markets - Results
Results for product code 1212.21 from Japan to Belgium

Tariffs

Rules of origin

Rules of Origin Self-Assessment (ROSA)

Origin documentation and verification

Taxes

Import requirements

Overview

General

Specific

Control of contaminants in foodstuffs

Control of pesticide residues in

Import requirements
latest update: 30 January 2024

This section presents:

- A general overview of the European Union requirements to be met when importing goods from third countries. These measures are adopted to protect public health, environment, etc. and apply the most relevant EU policies on food safety, animal health, environmental protection, technical standardisation, import restrictions, marking and labelling.
- General requirements are the general formalities and documents required for importing goods from third countries into the EU irrespective of the country of origin.
- Specific requirements on non-tariff measures that are applicable per country of origin.
- National competent authorities and legislation (when EU legislation is not directly applicable) specific requirement consulted is provided for the selected Member State of destination.

Product requirements
Information on EU rules and requirements for your product.

Access2Markets - Results information

will help you stay
dies.

needed. Regulatory
aining compliance.

market notifications to
, the company uses
requirements and
health, safety, and



Figure 4 Regulatory Readiness Level: Example EU's Access2Markets database

Step 5: Contact regulators and establish mechanisms/processes for applicable regulations and standards

Engaging with regulators early in the development process ensures that the product aligns with current standards and minimizes the risk of delays due to non-compliance. Establishing clear communication channels with regulatory bodies can help identify necessary conformity assessments and approvals, avoiding potential regulatory pitfalls. These

interactions are essential to understand how regulations apply to the product and how to implement the required compliance processes effectively.

HOW TO

1. **Identify Relevant Regulatory Authorities:**

Identify the regulatory authorities responsible for approving and overseeing your product in the target market. For products being introduced in the EU, Notified Bodies listed on the [NANDO Website](#) (New Approach Notified and Designated Organizations) are the designated organizations that assess compliance.

2. **Establish Communication Channels:**

Set up formal communication with these regulatory bodies early on. Engaging with them ensures that you are updated on any changes in regulatory requirements and allows you to ask for clarifications, submit questions, or seek pre-approval guidance.

3. **Understand Conformity Requirements:**

Different products require different assessments for conformity. Notified Bodies conduct conformity assessments for specific product categories, ensuring that the product meets legal and safety standards before entering the market.

4. **Document Processes and Compliance Pathways:**

Create an internal mechanism for tracking compliance progress and submissions. Develop clear documentation for all interactions with regulatory bodies, outlining submission timelines, required documentation, and responses from authorities.

5. **Assign a Compliance Team:**

Designate a dedicated team or personnel responsible for maintaining ongoing communication with regulators and managing the submission of regulatory documents.

EXAMPLE

A company developing a marine restoration technology identifies that it must work closely with Notified Bodies to ensure compliance with EU market regulations. Using the NANDO website, the company locates the relevant bodies based on legislation and submits an initial query. It assigns a team to manage ongoing communication with these bodies and begins the conformity assessment process by preparing detailed technical documentation. By actively engaging with the regulatory bodies, the company ensures that it remains aligned with all regulatory expectations, paving the way for smooth market entry.

Step 6: Complete initial regulatory submissions and evaluation plan

Completing the initial regulatory submissions and outlining an evaluation plan is crucial for obtaining product approval and market entry. These submissions are necessary to

EXAMPLE

demonstrate that the product complies with all applicable legal, safety, and environmental requirements. Conformity assessments, testing, and certifications ensure the product aligns with legislative standards. The process may also involve a Notified Body, which is responsible for carrying out the conformity assessment if mandated by the product's regulatory classification (European Commission, Conformity assessment, n.d.).

A marine restoration company submits its new technology for EU market approval. It conducts a conformity assessment to ensure the product meets all safety and environmental regulations. Since the technology falls under specific legislation, the company involves a Notified Body to carry out third-party validation. It prepares a Declaration of Conformity (DoC) listing the product details, legislative standards, and the involvement of the Notified Body. The company uses the Access2Markets database to verify the standards that must be met and submits the required documentation, including the DoC and technical reports, to regulatory bodies. The company also establishes an evaluation plan to monitor the approval process and adjust its strategy based on feedback.

HOW TO

1. **Conduct Conformity Assessment:**

Before placing a product on the EU market, conduct a [conformity assessment](#) to verify that it meets all applicable legislative requirements. This involves testing, inspections, and certification to ensure the product is compliant.

2. **Determine Notified Body Involvement:**

If the product's regulations require third-party validation, involve a Notified Body from the [NANDO list](#). They will assess whether the product meets EU safety and quality standards.

3. **Prepare the Declaration of Conformity (DoC):**

Create a [Declaration of Conformity](#) (DoC) to confirm that the product complies with relevant EU legislation. The DoC should include detailed information such as product identification, applicable legislation, manufacturer details, the involvement of any Notified Body, and references to harmonized standards or other normative documents.

4. **Submit Required Documentation:**

Submit all necessary documents to the relevant regulatory bodies, including safety assessments, test results, and the DoC. Each regulatory body may require different documentation depending on the product and market.

5. **Create an Evaluation Plan:**

Outline a plan to evaluate the regulatory submission process and ensure that all necessary requirements are met. This plan should include timelines for submission, monitoring of regulatory body responses, and tracking compliance updates.

6. **Prepare for Post-Submission Evaluation:**

Once submissions are complete, be prepared for follow-up queries or requests from regulatory authorities. Adjust the evaluation plan accordingly to address any feedback and ensure swift progression through the approval process.

6. Affix the CE Marking and Prepare the Declaration of Conformity:

affix the CE marking and prepare the EU Declaration of Conformity. The manufacturer is responsible for ensuring the marking is correct and complies with regulations.

7. Identify and Document Potential Risks:

In the technical file, identify all potential risks associated with your product and describe how these risks are managed or mitigated.

Step 7: QMS Certification and technical File Preparation

In the EU, certain products must adhere to strict quality management systems (QMS) to ensure compliance with safety, health, and environmental standards. The [CE](#) marking is one of the most significant certifications, required for products ranging from medical devices to industrial machinery. Additionally, other certifications and [labels](#), such as energy labels and the EU Ecolabel, provide further guarantees of a product's environmental performance. Proper documentation, including technical files, is essential to demonstrate compliance and to justify the EU Declaration of Conformity.

HOW TO (European Commission, Manufacturers, n.d.)

1. Identify Applicable Directives and Harmonized Standards:

Determine which EU directives and harmonized standards apply to your product. This step ensures that your product aligns with the correct regulations.

2. Verify Product-Specific Requirements:

Confirm any additional product-specific requirements. These could be related to the industry, country, or type of product being developed.

3. Assess the Need for Notified Body Involvement:

Determine whether your product requires independent [conformity assessment](#) by a notified body, as detailed in steps 5 and 6. This is often necessary for more complex or high-risk products.

4. Conduct Product Testing:

Perform the necessary testing to check your product's compliance with EU directives. This includes safety, health, and environmental protection standards.

5. Prepare the Technical File:

Create a comprehensive technical file containing all required documentation that proves your product meets the necessary requirements (European Commission, Technical documentation and EU declaration of conformity, n.d.). This file should include descriptions, test results, a list of parts, and other essential [documents](#).

3. **Ensure Product Traceability:**

Comply with traceability regulations:

- Preserve the technical documentation.
- Provide a clear product identification, such as a type, batch, or serial number.
- Indicate the manufacturer's name and address on the product itself.

4. **CE Marking:**

Affix the [CE](#) marking to the product. The CE marking signifies compliance with applicable regulations and enables market approval across the EU.

5. **Maintain Records:**

Ensure that all technical documentation and submission records are preserved for future regulatory audits or market surveillance.

documenting the results in the technical file. This file includes detailed descriptions, test results, a list of parts, and a comprehensive risk assessment.

Once the product passes the necessary conformity assessments, the company affixes the CE marking and prepares an EU Declaration of Conformity, enabling it to enter the EU market.

Step 8: Regulatory submissions and market approval

After ensuring a product meets the necessary regulatory requirements, the next step is to prepare and submit the product for market approval. For products sold in the EU, this often involves obtaining a CE marking, which certifies that the product meets EU safety, health, and environmental standards. Achieving this approval allows for the legal commercialization of the product within the EU market. Additionally, manufacturers must fulfill traceability and labeling requirements to ensure transparency and consumer safety.

HOW TO

1. **Submit the Technical Documentation:**

Submit the product's technical documentation to the relevant authorities. This file includes information like test results, safety assessments, and conformity declarations.

2. **Provide Instructions and Safety Information:**

Once approved, the product must include clear instructions and safety information. These must be provided in a language understood by consumers and end-users in the target market, ensuring compliance with EU language requirements.

HOW TO

1. **Monitor Legislative Changes:**

The company must remain vigilant about any changes in regulatory legislation that may impact their products. The EU often provides a transition period for adapting to new rules, enabling companies to adjust their products or find replacements if necessary.

2. **Establish a Post-Market Surveillance System:**

Develop a PMS plan that includes continuous product performance monitoring and feedback collection from users. This system helps to identify potential issues early and ensure ongoing compliance.

3. **Report Safety Issues:**

If any product defects or safety concerns are identified, companies must report them to the appropriate regulatory bodies and take necessary actions, including recalls if needed. This process ensures consumer safety and adherence to regulatory standards.

4. **Document Non-Conformities:**

Keep detailed records of any deviations from expected performance, including product failures or safety incidents. This documentation is essential for demonstrating compliance with post-market regulations.

5. **Adapt and Respond:**

If new regulatory requirements are introduced, the company must adapt products accordingly or face the risk of a product ban. The transition period provided by the EU should be used to make the necessary adjustments or find suitable replacements.

the performance of their products, stay informed about any legislative changes, and report any safety issues or non-conformities that arise. Post-market activities ensure that products remain safe, reliable, and compliant throughout their lifecycle.

EXAMPLE

A company producing marine restoration equipment in the EU is informed of an upcoming legislative amendment affecting environmental impact regulations. During the transition period, the company re-evaluates its product, making necessary modifications to comply with the new standards. They also monitor customer feedback to ensure ongoing product performance and report any detected safety concerns to the appropriate regulatory bodies.

2.6 Acceptance Readiness Level

The Acceptance Readiness Level (ARL) framework evaluates how well a new technology or product is likely to be accepted by society. Its purpose is to systematically examine potential ethical, social, and legal concerns that could impact acceptance (Vik, 2021). This section provides a structured checklist of questions designed to assess the product's societal alignment; these should be addressed sequentially to guide the readiness evaluation. When any question is answered positively, it indicates the currently achieved level of readiness. Companies are advised to consider these aspects early in the conceptualization phase to mitigate potential acceptance issues in later stages of development.

Stage 1: Conceptualize

Step 1: Is the product seen as illegitimate or socially unacceptable?

The first step in evaluating acceptance readiness is to assess if the product may be seen as illegitimate or socially unacceptable. This includes reviewing legal compliance, societal acceptance, and ethics to identify concerns early and adjust development strategies if needed (Vik, 2021).

HOW TO

- 1. Check for Legal Compliance:**

Ensure the product complies with laws and regulations across regions by consulting legal experts, reviewing standards, and aligning with consumer protection, environmental, and safety requirements.

- 2. Assess Public Safety and Health Risks:**

Evaluate potential health or safety hazards associated with the product. Products that might harm users, animals, or the environment could face strong opposition, so conduct risk assessments to ensure compliance with health standards.

- 3. Evaluate Ethical Practices:**

Examine the product's association with ethical issues like labor practices, sourcing, and environmental impact. Ethical missteps, such as exploitative labor practices, discrimination, or environmental harm, can result in social rejection.

- 4. Analyze Potential Societal Impact:**

Consider the wider societal effects of the product by assessing its environmental, social, and behavioral implications. A product perceived as harmful to community values or contributing to environmental degradation can be deemed unacceptable.

EXAMPLE

A company developing an innovative marine restoration technology, like an artificial reef, ensures compliance with environmental regulations and marine protection laws. The team assesses ecosystem impacts, potential risks to marine life, and ethical considerations, ensuring materials are environmentally safe. By consulting local communities, including fishermen and conservation groups, the company addresses societal perceptions, making the product socially acceptable and aligned with conservation goals.

Step 2: Is the product controversial among large part of the population?

To determine if a product is perceived as controversial, companies must assess public sentiment and identify any significant disagreements surrounding the product. A controversial product typically generates significant debate or contention, often linked to ethical, social, or political issues. This approach helps the organization navigate the complexities of public perception, ensuring that they are well-prepared to address any controversies before advancing the product further in the development process.

HOW TO

1. **Conduct Public Opinion Research:**

Utilize surveys, focus groups, or interviews to gauge the public's perception of the product. Explore potential divides in opinion among different demographics, such as age, location, or socioeconomic status (Harrison, 2020).

2. **Engage with Stakeholders:**

Involve stakeholders, including customers, community groups, and industry experts, in discussions about the product. Collect qualitative feedback to identify concerns or support, which can shed light on the product's controversial aspects (Vik, 2021).

3. **Monitor Media Coverage:**

Analyze media articles, blogs, and social media platforms to track public discourse about the product. Look for patterns in reporting or discussion that indicate significant controversy or disagreement (Heinrich, 2021).

4. **Identify Ethical, Social, or Political Concerns:**

Assess if the product raises ethical dilemmas or social issues that could lead to controversy. Consider factors such as environmental impact, health risks, or potential for misuse, as these can influence public acceptance (Harrison, 2020).

EXAMPLE

A marine restoration initiative, aimed at deploying artificial reefs to enhance fish populations, faces controversy among different stakeholder groups. Environmental activists' express concerns about the potential ecological impact of artificial structures disrupting natural habitats. Conversely, local fishing communities support the initiative for its potential to boost fish stocks, leading to economic benefits. Conducting public opinion surveys reveals a split in support, with younger populations leaning toward environmental protection while older demographics prioritize economic gains. This nuanced understanding highlights the controversial nature of the initiative, necessitating further dialogue and adjustments to align with broader societal values.

Step 2: Is the product seen as questionable among groups of the population?

SURVEY QUESTIONS

The next step is to analyze whether the product is viewed as questionable among certain segments of the population. While controversial products evoke strong disagreements, questionable products raise doubts or ethical concerns about their legitimacy without necessarily sparking widespread debate. Companies can leverage insights from the previous step to address this issue. This assessment enables the company to address specific doubts, adjust messaging, and possibly refine the product formulation before further development, ensuring that the product aligns with ethical standards and community expectations.

HOW TO

2. Environmental Impact:

1. Review Feedback from Stakeholders:

- Analyze comments and concerns raised by stakeholders during previous stages of development. Do you feel that the biopesticide poses any risks to human health or safety?
- Engage your stakeholders in the long-term ecological effects of using this product in various environments? Do you believe the biopesticide will be in controlling invasive species?
- How effective do you believe the biopesticide will be in controlling invasive species?
- How important is it for companies to engage with community stakeholders regarding the product's legitimacy or ethical implications (Vik, 2021).

2. Conduct Targeted Surveys:

- Deploy surveys focused on specific population groups that may harbor skepticism. Do you feel that the biopesticide poses any risks to human health or safety?
- Include questions that gauge perceptions of the product's ethics, safety, or environmental impact (Heinrich, 2021).
- How important are safety measures associated with the use of this product?

3. Analyze Case Studies:

- Study similar products or technologies that have faced questions about their legitimacy. Learning from their experiences can help identify potential pitfalls and inform strategies to address skepticism (Harrison, 2020).
- Do you believe that the development of this product aligns with ethical standards in environmental protection?

4. Monitor Regulatory and Media Discussions:

- Keep an eye on regulatory debates and media coverage surrounding the product category. Emerging concerns or scrutiny in these areas can indicate that the product is questionable (Heinrich, 2021).
- What ethical concerns do you have regarding the use of biopesticides in natural ecosystems?

5. Regulatory Approval:

- How confident are you in the regulatory processes that govern the approval of this biopesticide?

EXAMPLE

Do you think more rigorous testing should be conducted before this product is widely adopted?

A marine restoration initiative, aimed at deploying artificial reefs to enhance fish populations, introduced a new marine biopesticide designed to control invasive species faces scrutiny among environmentalists. While some stakeholders appreciate its innovative approach, others question its long-term ecological impact and potential harm to non-target species. Do you feel skeptical, the companies were adequately tested during the product's development? How important is it for companies to engage with community stakeholders regarding the use of such products?

7. General Sentiment:

- Overall, how would you rate your acceptance of the new marine biopesticide on a scale of 1 to 10?
- What factors would influence your willingness to support or oppose the use of this biopesticide in your community?

Step 4: Is the product seen as questionable by key actors in the sector?

INTERVIEW QUESTIONS

In this step, companies must analyze whether their product is viewed as questionable by influential actors in the relevant sector. Key stakeholders in marine industries may include port authorities, shipping and shipbuilding companies, offshore energy firms, marine research and education institutions, and government agencies, including multilateral organizations like the United Nations Environment Programme (UNEP) and the International Union for Conservation of Nature (IUCN). Their perspectives can significantly influence the product's acceptance and market viability. This approach ensures that the product not only meets regulatory standards but also aligns with the expectations and values of key actors in the marine sector, increasing the likelihood of market adoption.

Product Understanding

- How familiar are you with biodegradable materials used in marine restoration?
- What are your first impressions of this product's potential for marine habitats?

Perceived Benefits

- How do you see this material contributing to marine restoration?
- Which features of the product seem most beneficial for ecosystems?

HOW TO

3. Concerns and Questions

1. Engage with Key Stakeholders:

- Do you have any concerns about long-term effects in marine environments? Facilitate discussions with industry leaders, regulatory bodies, and environmental organizations to gather their insights. Their feedback can highlight any concerns related to its legitimacy or suitability for marine environments (Vik, 2021).
- What performance criteria should this material meet in marine applications?

4. Regulatory and Compliance Issues

2. Conduct Expert Interviews:

- How do you view its compliance with marine environmental regulations?
- Interview experts from relevant sectors to assess their views on the product. Understanding their concerns or reservations can provide critical information on the product's perceived legitimacy (Harrison, 2020).
- What guidelines or standards do you think should be in place for materials used in marine restoration?

3. Collaborate and Support Conferences:

- Participate in industry-specific forums, conferences, and workshops to understand prevailing attitudes towards the product. These venues can serve as platforms for networking and obtaining informal feedback from key players (Heinrich, 2021).
- What resources or support would you need to facilitate the implementation of this product in your projects?

4. Monitor Regulatory and Policy Developments:

6. Market Potential

- Stay updated on regulatory changes and policy discussions that may affect the product. Key actors often have insights into upcoming regulations that could render a product questionable (Harrison, 2020).
- How do you perceive the market demand for biodegradable materials in the marine sector?
- What factors influence the adoption of sustainable materials in marine restoration practices?

EXAMPLE

7. Feedback for Improvement

A company developing an innovative biodegradable material for marine habitat restoration initiatives seeks validation from key actors in the marine industry. This material is designed to provide structural support for coral reefs and other marine ecosystems while minimizing environmental impact. The company engages with marine research institutions, restoration NGOs, and government agencies to discuss the material's effectiveness and potential benefits for marine restoration projects.

8. Impact Measurement

Through interviews and consultations, the company discovers that while many stakeholders appreciate the material's sustainable properties, concerns arise regarding its long-term stability and effects on marine organisms. By recognizing these concerns, the company can refine its product, ensuring it meets the expectations of key actors involved in marine restoration. Collaborating with marine biologists and restoration practitioners, they conduct further studies to demonstrate the material's compatibility with marine ecosystems, thereby enhancing its credibility and addressing any skepticism from influential stakeholders.

Step 5: Is the use of the product seen as questionable within marginal interest groups?

In this step, companies evaluate whether the product is viewed as questionable by marginal interest groups, who often raise concerns outside mainstream viewpoints. While these groups may represent a small segment of society, they can exert significant influence on public perception, especially in areas related to ethics, sustainability, and social responsibility. To assess this, companies can employ similar methods used in previous steps, such as targeted engagement and sentiment analysis, with an emphasis on understanding specific concerns raised by these niche groups.

HOW TO

1. **Identify Relevant Marginal Interest Groups:**

Start by listing groups with interests that might uniquely intersect with the product. For marine restoration, this could include advocacy organizations for rare or local marine species, small coastal community groups, or eco-tourism advocates focused on preserving fragile marine ecosystems.

2. **Engage with Group Representatives:**

Connect with these groups to understand their concerns. This may involve conducting interviews, focus groups, or even attending public meetings they organize.

3. **Monitor Social Media and Public Discourse:**

Track platforms where these groups are active to gauge sentiment and identify emerging concerns. Look for recurring themes or questions that reflect specific hesitations about the product.

4. **Adjust Communication and Product Strategy:**

Based on findings, consider ways to address these concerns, whether through adjustments in product design, enhanced transparency, or public education.

EXAMPLE

A company introducing an artificial substrate for coral restoration receives feedback from a niche coastal community organization concerned about potential impacts on local biodiversity. The group fears that introducing artificial structures may alter native species' natural habitats. To address these concerns, the company organizes a community forum, allowing scientists to present evidence of the substrate's benefits for biodiversity. By addressing these niche concerns directly, the company not only improves acceptance among this marginal group but also strengthens its public reputation for transparency and environmental consideration.

Step 6: Is the use and the production of the product socially not accepted in general?

The final step evaluates whether the overall use and production of a product align with broad societal norms and ethical standards. Social acceptance in this context refers to a product's alignment with safety, environmental sustainability, and positive societal impact. Products generally achieve high social acceptance when they are perceived to contribute positively to society without causing harm to people or the environment. In cases where these norms are not met, companies may need to adjust production processes, improve transparency, or redesign the product to meet societal expectations.

HOW TO

1. Evaluate Societal Norms and Values:

Review the product's alignment with broad societal norms around safety, environmental sustainability, and ethics. Consider if the production process and materials are viewed as responsible and acceptable to general public sentiment.

2. Use Technology Acceptance Model (TAM) or User Acceptance Testing (UAT) if Applicable:

- For technology or software products, use TAM to understand perceived usefulness and ease of use. TAM provides insights into whether users see the product as valuable and accessible, both essential elements for social acceptance.
- For software products, UAT can be applied to assess the product's suitability and reception, identifying any usability concerns or social objections early in the testing phase. Incorporating feedback from UAT helps adjust the product to meet societal expectations.

3. Assess Broader Impact:

Analyze the environmental, social, and economic impacts of the product to determine if there are potential objections. Addressing these issues proactively can enhance societal acceptance.

EXAMPLE

A company developing a marine restoration technology for coastal ecosystems may conduct stakeholder outreach to determine if any production processes raise social concerns, such as the impact on local communities or marine habitats. By integrating feedback from TAM and UAT, the company identifies specific elements that stakeholders appreciate, such as the product's sustainability and minimal ecological footprint. This validation allows the company to proceed confidently, knowing the product aligns with societal expectations.

EXAMPLE 2.7 Societal Readiness Level

Coastal ecosystems are vital to human societies, supporting livelihoods, providing food security, and nurturing cultural connections to marine environments (Muganyizi, 2022). As the world becomes increasingly aware of the need for sustainable energy, the urgency of evaluating the societal readiness of innovations has become essential for fostering a resilient economic, environmental, and social future. Societal Readiness Levels (SRLs) help evaluate how prepared communities and stakeholders are to adopt new technologies, policies, or projects, especially those that impact public well-being, ecosystems, and economic stability. Developing a strong societal readiness framework involves assessing public awareness, stakeholder engagement, and the potential societal impacts of innovations or interventions. Societal readiness integrates multiple factors, including cultural acceptance, economic feasibility, and the capacity for communities to adapt. This holistic approach ensures that new initiatives not only advance scientifically but are also embraced by the societies they aim to benefit (Büscher, 2023). By aligning SRLs with societal goals and needs, organizations can better implement sustainable practices and promote long-term community resilience. This section provides guidance for organizations and projects in assessing and advancing their societal readiness to ensure successful implementation of innovations in the maritime sector.

Stage 1: Conceptualize

Step 1: Identifying Problems

The first step in societal readiness is to develop a clear understanding of the problem your solution aims to address. This requires identifying the root causes of the societal, environmental, or economic issue at hand. By doing so, companies can align their solutions with real-world challenges, ensuring relevance and impact (Bernstein, 2022). At this stage, the focus is on collecting data, assessing current challenges, and understanding how these problems affect different stakeholders. Defining the scope and urgency of the issue helps to lay the foundation for further concept development.

HOW TO

- 1. Conduct Problem Research:**

Gather data on societal, environmental, and market conditions to understand the broader context of the problem. Use research papers, industry reports, and case studies to determine the significance of the issue.

- 2. Engage with Affected Stakeholders:**

Consult stakeholders who are directly impacted by the problem to gather first-hand insights. Engaging with communities, customers, or environmental groups can reveal pain points, clarifying the problem's magnitude and its societal impact.

- 3. Analyze Root Causes:**

Identify the core drivers behind the problem by using tools like root cause analysis (Ishikawa diagrams, 5 Whys). This helps in defining the systemic issues that need to be addressed and ensures the problem is understood from all angles.

- 4. Prioritize the Urgency of the Issue:**

Assess the urgency and the potential consequences. Prioritize which problems need immediate action and can lead to more targeted solutions that resonate with society.

EXAMPLE

A startup focused on restoring marine ecosystems develops a concept for a biocircular, scalable solution to address coastal erosion. The solution integrates natural barriers, such as oyster reefs and mangroves, that regenerate and provide protection to shorelines. The company engages with coastal communities and environmental agencies early in the process to ensure the solution aligns with local needs and social acceptance.

Step 2: Create Concept with Potential for Systemic Change

Once the problem is clearly defined, the next step is to create a concept that not only addresses the issue but has the potential for (sub)systemic change. The goal is to ensure that the solution is socially acceptable, environmentally sustainable, and capable of being scaled or adapted to other regions or contexts. A well-thought-out concept should balance innovation with practicality, ensuring that it can integrate with existing systems while still having transformative potential. This stage focuses on designing solutions that consider biocircularity—using renewable resources and minimizing waste—and other sustainability principles, ensuring long-term impact (Büscher, 2023). Companies need to consider the broader societal implications of their innovations to avoid negative side effects and ensure public acceptance.

HOW TO

1. **Design for Biocircularity:**

Develop a concept promoting resource regeneration and sustainability by using renewable resources, reducing waste, and recycling. Focus on eco-friendly solutions that lower the carbon footprint of current systems.

2. **Ensure Societal Relevance:**

Align the concept with societal needs and values, ensuring that it addresses key social and cultural concerns. Consider the economic, social, and environmental impacts, making sure the concept is acceptable to all stakeholders.

3. **Consider Long-Term Impact and Scalability:**

Design scalable, adaptable solutions that can expand beyond the initial region and remain effective in different contexts. Consider the potential for systemic change, where the solution inspires changes in policy, business models, or public behavior.

4. **Engage Stakeholders Early:**

Collaborate with key stakeholders to refine the concept and ensure it aligns with their expectations and needs. This will not only enhance the societal acceptability of the solution but also increase the likelihood of its adoption and success in the long term.

EXAMPLE

A company working on marine ecosystem restoration proposes a biodegradable filtration system to combat coastal water pollution. Designed to filter pollutants while allowing natural water flow, it aims to restore marine biodiversity. The company engages stakeholders, including environmental NGOs, coastal communities, and government agencies, to refine the system. Collaboration ensures the solution meets local conditions, regulatory requirements, and societal standards, maximizing its impact on pollution reduction.

Stage 2: Prototype

Step 3: Propose Solutions and Identify Relevant Stakeholders

At this stage, the focus shifts from concept creation to proposing concrete solutions that can be tested and refined. Companies need to craft detailed solutions that have the potential to address the identified problem while considering their environmental and societal impact. Identifying relevant stakeholders is also critical at this point, as their involvement can guide the refinement of the solution and ensure its relevance in real-world settings. The aim here is to propose actionable solutions that align with the systemic changes outlined in Step 2. Stakeholders—such as customers, communities, regulators, and industry experts—play a crucial role in providing feedback and helping to shape the proposed solution for optimal impact (Bernstein, 2022).

HOW TO

1. **Develop a Detailed Solution:**

Create a solution that directly addresses the problem defined in Step 1 and is grounded in the concepts of biocircularity and sustainability introduced in Step 2. The solution should be practical, innovative, and feasible for real-world application, while also considering the scalability for broader impact.

2. **Identify and Engage Stakeholders:**

Identify key stakeholders who have a direct or indirect interest in the solution. This includes end-users, community groups, government agencies, industry leaders, or environmental organizations. Engage them early to gather insights on the solution's viability, potential challenges, and areas for improvement.

3. **Assess Feasibility and Potential Impact:**

Evaluate the solution's feasibility in terms of technology, cost, and resources, while also assessing short- and long-term environmental and societal impacts to ensure viability and potential for systemic change.

4. **Incorporate Stakeholder Feedback:**

Use stakeholder input to refine the solution, ensuring it aligns with their needs and expectations. Collaborate with stakeholders to foster buy-in and facilitate smoother implementation.

EXAMPLE

A renewable energy company is testing a solar-powered desalination device to provide clean water for coastal communities. Initial testing involves collaboration with local environmental groups, municipal authorities, and community leaders. The company establishes clear objectives, including water output, energy efficiency, and ease of use. In a pilot environment along the coastline, they test the device under various weather conditions to simulate real-world scenarios. Feedback from stakeholders indicates that while the device performs well, its maintenance requirements need to be simplified for long-term adoption.

Step 4: Initial Testing of Proposed Solution with Relevant Stakeholders

With a concrete solution and stakeholder involvement established, the next step is initial testing in a controlled, relevant environment. This stage is crucial for gathering preliminary data and feedback to assess the viability of the solution. By engaging stakeholders during testing, companies can fine-tune the solution, address unforeseen challenges, and ensure alignment with societal expectations and environmental goals. Initial testing lays the foundation for wider adoption and later stages of development by providing data-driven insights into the solution's effectiveness and impact (Bernstein, 2022).

HOW TO

1. **Set Clear Testing Objectives:**

Define specific goals for testing, such as performance benchmarks, environmental impact measures, or social acceptability criteria. These objectives provide a clear framework for evaluating success and identifying areas for improvement.

2. **Engage Stakeholders in Testing:**

Involve key stakeholders—customers, communities, and regulators—in testing to gather diverse feedback to help refine the solution, confirm its practicality, and ensure alignment with local expectations.

3. **Use Pilot Environments:**

Conduct testing in controlled environments that simulate real-world conditions. Pilot settings allow risk-free adjustments, manageable scaling, and gradual stakeholder engagement.

4. **Collect Data and Analyze Results:**

Gather quantitative and qualitative data on performance, usability, and stakeholder satisfaction. Analyzing this data identifies strengths, weaknesses, and challenges, offering a basis for refining the solution.

5. **Iterate Based on Feedback:**

Make adjustments based on testing and stakeholder feedback. Iterating improves solution effectiveness, stakeholder alignment, and readiness for the next development phases.

EXAMPLE

A company developing a biodegradable fishing net designed to reduce marine waste conducts pilot testing along the North Sea coast, where lost nets contribute significantly to local marine pollution. They define impact metrics, including degradation rate, durability, and environmental safety. Partnering with fishing communities and marine conservation groups, the company tests the nets under typical fishing conditions, gathering data on performance and stakeholder acceptance. Analysis reveals that while the nets degrade effectively, slight adjustments in durability could improve their usability for local fishers.

Stage 3: Develop & Test

Step 5: Validate the Problem Through Pilot Testing

In this step, the goal is to validate the initial solution through pilot tests in real or closely replicated environments. This phase is crucial for assessing the solution's effectiveness and alignment with societal needs. Targeted testing helps companies measure initial impact, identify improvement areas, and confirm societal relevance. This phase bridges conceptual development and practical implementation, ensuring the solution can be effectively scaled and adapted (Büscher, 2023).

HOW TO

1. Define Impact Metrics:

Establish specific metrics to evaluate the pilot's success, including environmental impact indicators, cost savings, and social benefits. Clear metrics enable objective assessment of the solution's effectiveness in addressing the target problem.

2. Select Representative Testing Sites:

Choose pilot sites that reflect the real-world environments for eventual deployment. Testing in relevant settings reveals operational challenges and regional adaptability, preparing the solution for broader application.

3. Involve Local Stakeholders:

Engage community members, industry experts, and local organizations in pilot testing to gather diverse perspectives and ensure the solution meets societal expectations.

4. Monitor and Analyze Outcomes:

Collect and analyze data during the pilot, focusing on performance metrics, usability, and stakeholder feedback. This analysis offers evidence of the solution's impact, highlighting strengths and areas for improvement.

5. Document Findings for Future Phases:

Record results and key insights from the pilot testing phase. This documentation will guide design refinements and inform stakeholders in later development and commercialization phases.

EXAMPLE

A startup working on a waste-reduction initiative for coastal tourism collaborates with local authorities, environmental groups, and tourism operators in pilot locations. They conduct interactive workshops where stakeholders use the solution—a mobile app that tracks waste reduction efforts and provides incentives for sustainable behavior. Feedback reveals that while the app is intuitive, adding more localized content could increase engagement among different user groups. After refining the app based on these suggestions, the startup Step 6: Validate Proposed Solution with Relevant Stakeholders Step 7: Experimentation and Refinement, pilot testing sites by gathering feedback from a broader range of stakeholders. The solution is tested with individuals, communities, and organizations affected by its outcomes. This validation ensures the solution is effective and socially accepted, facilitating smoother implementation in various contexts. Engaging stakeholders allows companies to refine the solution using real-world insights, enhancing its practicality and impact (Büscher, 2023); (Sari, 2016).

HOW TO

1. Identify Key Stakeholders:

Identify stakeholders affected by, involved with, or influential in the solution's impact area, including local communities, regulatory bodies, environmental organizations, and industry partners, each providing unique perspectives.

2. Conduct Collaborative Testing Sessions:

Arrange sessions where stakeholders can interact with the solution, share feedback, and provide insights on its potential impact. Structured feedback sessions capture diverse opinions and reveal areas for adjustment.

3. Gather Qualitative and Quantitative Feedback:

Use surveys, interviews, and performance metrics to collect both qualitative and quantitative data from stakeholders to understand the solution's real-world viability and societal readiness.

4. Refine Solution Based on Stakeholder Input:

Analyze the collected feedback to identify necessary changes. Making adjustments based on real-world usage and community feedback increases the solution's relevance and acceptance in its target environment.

5. Document Stakeholder Validation Outcomes:

Record the validation process, insights gained, and adjustments made in response to stakeholder feedback. This documentation strengthens stakeholder trust, establishes transparency, and prepares the solution for demonstration in the next stage.

EXAMPLE

A company developing a sustainable fisheries management tool tests it in collaboration with coastal communities and regulatory agencies. They deploy the tool in a selected region, where stakeholders can monitor fish populations and manage harvest levels. Feedback sessions reveal that fishers appreciate the tool but require more localized data to maximize utility. Based on this input, the company adapts the tool to provide area-specific insights. **Step 7: Demonstrate Solution in Relevant Environment and Gather Feedback**
Deploying the solution in a real-world environment allows the company to test it with a broader network of stakeholders. This phase allows for observing its real-world impact, gathering feedback, and assessing societal acceptability. By engaging stakeholders and addressing concerns, companies can strengthen relationships and lay a supportive foundation for future implementation. Operational testing is crucial for refining the solution, optimizing performance, and adapting to the community's specific challenges (Bernstein, 2022); (Büscher, 2023).

HOW TO

1. **Conduct Field Testing in a Relevant Environment:**

Deploy the solution in the targeted operational environment, whether that's a specific community, industry sector, or geographical area to assess functionality and compatibility with local conditions.

2. **Host Collaborative Feedback Sessions:**

Engage stakeholders through workshops, focus groups, and discussions to gather insights on the solution's impact, usability, and acceptance. Collaborative sessions encourage open dialogue and provide diverse perspectives.

3. **Implement Performance Tracking Metrics:**

Set up clear KPIs and performance metrics. Quantitative data helps measure impact, while qualitative feedback from stakeholders reveals nuances in user experience.

4. **Iterate Based on Real-World Feedback:**

Use insights from the field test to refine the solution. Adjustments should address specific challenges and meet stakeholder expectations, ensuring the solution remains aligned with societal needs.

5. **Document and Analyze Demonstration Results:**

Document the outcomes of the demonstration phase, including key performance metrics, feedback summaries, and areas for improvement. This prepares the solution for final refinement before market entry.

EXAMPLE

Stage 4: Commercialize
Step 6: Refine Solution and Plan for Societal Adaptation

A developer of an eco-friendly coastal defense system refines the design based on the insights gathered in the demonstration phase. Local community members highlighted the need for more accessible maintenance features and better integration with existing coastal landscapes. In response, the team adapts the design to include modular components that blend seamlessly with natural features and require minimal upkeep. To facilitate societal adaptation, they plan a series of workshops to educate local maintenance teams on the system's upkeep. Through limited retesting, they confirm these updates enhance both functionality and user satisfaction, positioning the solution for successful integration into regional coastal management initiatives.

In Step 8, the solution undergoes final adjustments to ensure it aligns closely with stakeholder needs and the specific context of its application. This step involves refining the product, process, or service to maximize societal relevance and ensure that it addresses community requirements effectively. Additionally, creating a clear plan for societal adaptation is key, focusing on strategies for integrating the solution into existing social frameworks and ensuring widespread acceptance. Testing and minor retesting may also be required to confirm that all refinements contribute to the solution's effectiveness and readiness for market entry (Arvidsson, 2022); (Clément, 2022).

HOW TO

1. **Implement Final Refinements:**

Make necessary adjustments to enhance usability, relevance, and effectiveness in the intended environment based on previous feedback and performance results.

2. **Develop a Societal Adaptation Strategy:**

Create a plan detailing how the solution will integrate into existing social or industry frameworks, including any necessary training, education, or stakeholder engagement initiatives to facilitate acceptance.

3. **Reassess Stakeholder Needs and Expectations:**

Ensure the solution addresses the core needs identified earlier. Additional discussions or surveys can confirm that adjustments align with stakeholder priorities.

4. **Conduct Limited Retesting if Needed:**

Where changes occur, conduct small-scale testing to validate improvements in a real-world context, ensuring optimal performance before full implementation.

5. **Document Finalized Solution and Adaptation Plan:**

Prepare detailed documentation on the refined solution and adaptation strategy to serve as a reference for stakeholders and guide full-scale implementation.

EXAMPLE

Step 7: Finalize Solution and Societal Adoption Plan.

A sustainable fisheries management company has developed a solution to balance ecosystem health with local fishing practices. After rigorous testing and stakeholder feedback, the company finalizes a detailed adoption plan, including training workshops for local fishers, sustainable methods to support the industry, and addressing key performance indicators for performance and stocking. The plan integrates stability and ecosystem health. Steps for feedback included training, established with regulatory requirements for long-term success. By the end of this step, the solution should be ready with a plan that enables societal acceptance and implementation (Arsalson, 2022)(Chen, 2022). it is sustainable, socially accepted, and capable of making a long-term impact.

HOW TO

1. **Conduct a Comprehensive Solution Review:**

Perform a final evaluation to ensure the solution meets all intended specifications, addresses the identified societal needs, and is viable for widespread application.

2. **Define Key Performance Indicators (KPIs) for Long-term Tracking:**

Establish clear KPIs that will track the solution's impact over time. These indicators should focus on social, environmental, and economic performance in alignment with stakeholder expectations.

3. **Develop a Training and Support Framework:**

Plan necessary training sessions or workshops to support users, employees, or communities in understanding and adopting the solution effectively.

4. **Outline Ongoing Monitoring and Feedback Mechanisms:**

Create a plan for collecting and assessing feedback continuously post-implementation. Regular reviews of feedback allow for minor adjustments as the solution scales up.

5. **Prepare for Full-scale Implementation:**

Begin a phased rollout to ensure successful societal integration and prepare for necessary adjustments during the initial application stages.

Stage 5: Sustain

EXAMPLE

An aquaculture company has developed, and tested a sustainable fish-farming system designed to reduce water pollution and increase fish yield. After successful trials, the company presents this system to local government officials and community leaders, highlighting its benefits for the environment and the local economy. The company works with local government officials to secure necessary permits and regulatory requirements. Stakeholders, including local community members and environmental groups, are consulted to ensure the system meets their needs and expectations. The company makes necessary adjustments based on real-world performance and stakeholder feedback. The system is implemented at a full scale, ensuring that the benefits are effectively realized by the community. The structure of the organization is reviewed (Scherer 2023) (Boyd and Rouse 2006) and environmental benefits, establishing a sustainable, scalable model that can be replicated in similar regions globally.

HOW TO

1. **Deploy the Solution at Full Scale:**

Launch the solution in the designated environment, ensuring that all necessary systems, tools, and support networks are in place for smooth integration.

2. **Conduct Regular Monitoring and Data Collection:**

Begin consistent monitoring of the solution's performance against established KPIs, capturing data on social, environmental, and economic impacts.

3. **Maintain Open Channels for Stakeholder Feedback:**

Provide regular updates and gather ongoing feedback from stakeholders to confirm the solution meets their needs and expectations.

4. **Make Necessary Adjustments Based on Real-world Performance:**

Be ready to make adjustments based on monitoring data or stakeholder input, especially in early stages of full-scale implementation.

5. **Ensure Knowledge Transfer and Training Continuity:**

Establish or continue training and support programs to ensure all relevant parties are fully equipped to operate and maintain the solution long-term.

Step 11: Document Outcomes and Lessons Learned for Future Improvement

EXAMPLE

The final step is dedicated to comprehensive documentation and reflection on the implementation process, capturing valuable data on the solution's performance, societal impact, and lessons learned. Step 11 is critical for sustaining the solution's benefits over the long term and providing a knowledge base that can inform similar projects. By consolidating data and analyzing case outcomes, organizations and stakeholders can identify best practices and the ecosystem for future initiatives. This step ensures that the collected knowledge contributes to a body of resources that supports continuous learning and adaptation (Buscher, 2025).

After successfully implementing a coastal restoration project aimed at reducing erosion and promoting biodiversity, an environmental organization gathers data on shoreline changes, species return rates, and community satisfaction. It compiles this information into a comprehensive report that details the project's outcomes and evaluates its impact on both the ecosystem and local economies. The organization identifies best practices such as the use of native plants and community involvement, which contributed significantly to the project's success. It also notes challenges like weather-related delays and provides recommendations to improve scheduling in future projects. This report is then shared with other environmental groups and stakeholders through an online knowledge base, providing a model for similar initiatives worldwide.

HOW TO

1. Document Key Outcomes and Impact Data:

Summarize project outcomes by evaluating KPIs, societal impact measures, and stakeholder feedback to provide a clear view of the project's effectiveness.

2. Identify Best Practices and Areas for Improvement:

Reflect on successful strategies, any unforeseen challenges, and potential areas for enhancement to refine future project execution.

3. Compile Case Studies and Reports:

Create case studies that highlight major insights and recommendations based on the collected data, making them available to relevant teams and stakeholders.

4. Develop a Knowledge Sharing Framework:

Establish a process for sharing insights across the organization or network, ensuring the lessons learned inform and improve future projects.

5. Set Up Ongoing Monitoring or Follow-up Mechanisms:

Create guidelines for continued monitoring of societal impact if applicable, and consider periodic follow-ups to track the project's long-term effects.

EXAMPLE 2.8 ESG Readiness Level

Coastal water restoration supports economic livelihoods, provides food, and fosters socio-cultural connections to an intricate food system, locally. Our relationship with the ocean significantly influences forest ecosystems, cycles, and livelihoods (Mearns, 2022). By correctly applying the environmental, social, and governance (ESG) framework is vital for sustainable economic growth, societal development, and environmental protection, including freshwater ecosystems (Li, 2021). ESG principles drive corporate strategy and performance (Arvidsson, 2022), while ESG scores help direct investments and favor more sustainable and ethical businesses, aligning with the UN's Sustainable Development Goals. Thus, companies must ensure compliance with ESG standards to thrive long-term (Arvidsson, 2022). This section provides a guideline for companies to implement ESG standards in the annual reporting effectively.

Stage 1: Conceptualize

Environmental improved restoration efficiency, attractiveness, impact communication, improved monitoring, risk education

Social restoration, new reefs, low environmental impact, likeness to nature, coastline protection

Governance conducting an ESG (Environmental, Social, and Governance) strategy is to assess readiness and resources. This involves evaluating current ESG activities, risks, and resources while raising internal awareness about their importance. The assessment identifies strengths, weaknesses, and key processes, providing a clear overview of the company's status. Both internal reviews (reports, policies) and external research (regulatory guidelines) inform this gap analysis to guide improvements.

HOW TO

1. Perform a Gap Analysis:

Start with a [gap analysis](#) to assess the company's current ESG processes and initiatives by reviewing existing policies, reports, and procedures to identify strengths and gaps. Interviews with key stakeholders—employees, customers, and investors—offer valuable insights.

2. Evaluate Resources:

Assess whether your company has sufficient human and financial resources dedicated to ESG initiatives. This includes evaluating the skills and expertise of staff involved in ESG tasks and determining if additional training or hiring is necessary.

3. Conduct Industry-Specific Research:

Examine ESG guidelines and regulations specific to your industry, especially for specialized fields like marine restoration, biotechnology, or energy. Each sector has unique ESG needs, making this knowledge essential for strategic alignment.

4. Raise Awareness:

Ensure that all levels of the organization are informed about ESG initiatives. Raising awareness helps build internal support for ESG efforts and fosters a company-wide commitment to achieving ESG goals.

5. Establish Baseline ESG Data:

Gather and analyze data on the company's environmental, social, and governance performance to establish a baseline for future improvements and goal setting.

3. Assess Materiality:

Use a materiality matrix to rank issues by their importance to stakeholders and the company's long-term value. This matrix highlights the significance of each ESG issue based on stakeholder expectations and strategic relevance.

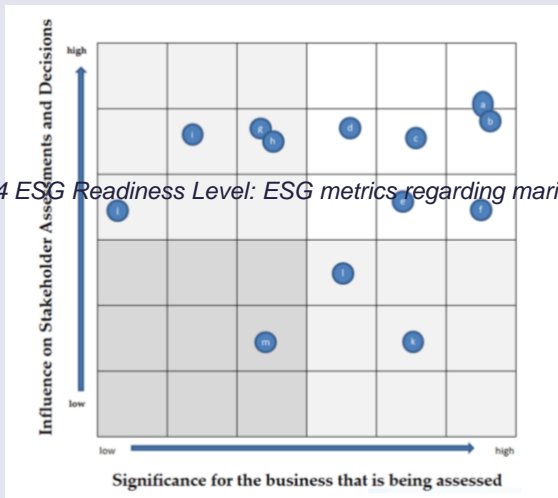


Table 14 ESG Readiness Level: ESG metrics regarding marine restoration based on (Graf, 2023)

4. Evaluate Impact:

For each ESG issue, assess the potential financial, regulatory, and reputational impacts on the business. Consider factors like regulatory compliance, stakeholder demands, and contributions to the company's sustainability goals.

5. Prioritize:

Prioritize ESG issues based on their materiality. Focus on the most pressing topics that have a significant impact on both the company and its stakeholders. These prioritized issues will form the basis for future ESG initiatives, resource allocation and reporting.

and implement targeted strategies aimed at enhancing its ESG score (Brightest, 2022).

HOW TO

1. Identify Key ESG Issues:

Gather information on potential ESG topics that could impact the company or its stakeholders. This includes industry-specific risks, regulatory trends, stakeholder feedback, and global sustainability frameworks like the [UN's Sustainable Development Goals](#) (SDGs) or [Global Reporting Initiative](#) (GRI) standards. In addition to these resources, public information regarding ESG criteria, voting procedures, and investing expectations can be found on the websites of institutional investors like [Vanguard](#) and [BlackRock](#).

2. Engage with Stakeholders:

Consult internal and external stakeholders—employees, investors, customers, and local communities—to understand their concerns and priorities and to assess what matters most to the company and its broader ecosystem.

Figure 5 ESG Readiness Level: Example illustration of a materiality matrix (Geldres-Weiss, 2021)

EXAMPLE

A company in the marine restoration industry uses a materiality analysis to identify key sustainability issues, such as the restoration of coral reefs and minimizing the environmental impact of restoration methods. By consulting with stakeholders and using a materiality matrix, the company identifies that protecting coastal ecosystems and contributing to local economies are high-priority issues. They then develop strategies to address these areas, ensuring that their ESG efforts align with both regulatory expectations and stakeholder needs.

Step 3: Engage key ESG stakeholders

Engaging stakeholders is a critical step in the ESG process, as it allows companies to align their strategies with the concerns and expectations of those impacted by their operations. Stakeholders, such as employees, customers, investors, local communities, and maritime organizations, play a pivotal role in shaping a company's ESG initiatives. By fostering open

communication, businesses can build trust, gather valuable insights, and strengthen their ESG reporting and performance. Effective stakeholder engagement ensures that ESG efforts are collaborative, responsive, and aligned with both societal and environmental needs.

HOW TO

1. **Identify Key Stakeholders:**

Map out relevant stakeholders, including internal (employees, management) and external (customers, investors, local communities, NGOs) groups. Focus on those who are most affected by or have a significant impact on the company's ESG performance.

2. **Establish Open Communication Channels:**

Create diverse platforms for stakeholder engagement, such as surveys, focus groups, town hall meetings, or online forums. Ensure that stakeholders can easily provide feedback and share concerns regarding the company's ESG practices.

3. **Integrate Stakeholder Feedback:**

Listen to and analyze stakeholder input to understand their priorities. Use their feedback to guide ESG strategies, ensuring that initiatives address both stakeholder concerns and business goals. This builds trust and enhances ESG reporting and performance.

4. **Foster Collaboration:**

Partner with stakeholders, including local communities and industry organizations, to co-create ESG solutions. Collaboration leads to innovative approaches that benefit both the company and the environment.

5. **Maintain Ongoing Dialogue:**

Regularly communicate updates on ESG initiatives and progress to stakeholders. Transparency and accountability are key to building long-term relationships and ensuring continued stakeholder support.

EXAMPLE

A company in the marine restoration sector engaged local coastal communities, environmental NGOs, and fishing associations as part of its stakeholder engagement strategy. By organizing community meetings and conducting surveys, the company gathered valuable feedback on its coastal restoration efforts. This input was used to refine their ESG strategy, ensuring that their restoration practices not only met environmental standards but also addressed the economic needs of local fishermen. Additionally, the company worked with investors and environmental groups to co-develop innovative restoration methods, leading to improved ecological outcomes and enhanced stakeholder relations.

Step 4: Integrate ESG into business strategy

After a thorough materiality analysis, the next step is to integrate identified ESG (Environmental, Social, and Governance) criteria into the core business strategy. The goal is to align social and environmental impacts with financial returns, fostering sustainable practices that create long-term value for the company and stakeholders (Delgado-Ceballos, 2023). This integration enhances socio-ecological outcomes and business resilience by recognizing key stakeholder attitudes, such as those of coastal communities in marine restoration (McAfee, 2022).

HOW TO

1. **Align ESG with Business Goals:**

Link key ESG issues with the company's overall mission and objectives. For instance, environmental criteria might shape product development, operations, or supply chains to reduce ecological impacts. Social and governance factors should drive employee engagement, community relations, and leadership to ensure inclusivity and ethical governance.

2. **Embed ESG in Decision-Making Processes:**

Incorporate ESG considerations into decision-making by establishing cross-functional teams to oversee projects and prioritizing ESG in leadership discussions. Integrate ESG into KPIs and management systems to ensure accountability at all levels.

3. **Overcome Barriers:**

Address common challenges such as lack of standardization in ESG data, underreported ESG performance, and high integration costs. Mitigating these obstacles may involve using third-party data providers or adopting internationally recognized standards from the Global Reporting Initiative (GRI) or the Sustainability Accounting Standards Board (SASB) (Eccles, 2017).

4. **Monitor and Measure Progress:**

Establish mechanisms for regular monitoring and evaluation of ESG performance by setting clear, measurable targets, collecting reliable data, and reviewing progress periodically. Integrating ESG into business performance reviews ensures sustainability goals align with long-term success.

5. **Communicate ESG Strategy:**

Communicate ESG progress and goals to stakeholders through regular reports, meetings, and various channels to ensure transparency to build trust and strengthen relationships, making ESG efforts resonate throughout the business ecosystem.

EXAMPLE

A marine restoration company in the Atlantic region integrated ESG by aligning environmental goals—restoring coral reefs and improving marine biodiversity—with business objectives like eco-tourism and sustainable fishing. They worked with coastal communities to create eco-tourism packages and sustainable fishing practices. The company also implemented a circular economy model, reducing waste and using recycled materials. This holistic approach improved their ESG performance, leading to increased investor interest and a stronger reputation. A strategic roadmap helps organizations align specific initiatives with ESG goals, ensuring structured implementation. The

roadmap serves as a clear guide for operationalizing sustainability efforts, assigning responsibilities, and setting timelines (Green Business Bureau, 2022). By focusing on top ESG priorities, businesses can drive measurable progress while integrating these efforts into their core strategy.

EXAMPLE
A marine restoration company has identified coastal ecosystem restoration and carbon reduction as key ESG priorities. To address this, the company creates a strategic roadmap with actionable steps for integrating ESG into its core business. This plan visualizes the impact of each ESG effort and aligns them with long-term business goals.

- **Portfolio strategy and products:** The company shifts to eco-friendly restoration methods to meet client demands for sustainable practices, ensuring minimal

HOW TO environmental impact.

1. **Identify Key ESG Priorities:**
 - **People and culture:** Employees receive training in marine restoration and sustainability, fostering a culture that champions ESG goals.
 - **Systems and processes:** The company updates its operations, based on the materiality analysis, stakeholder input, and industry standards. These priorities should align with both the company's long-term business objectives and sustainability goals.
 - **Performance metrics:** Measurable KPIs are set, like restoring ecosystems and reducing emissions by 30% over five years. These are tied to employee performance rewards.
2. **Set Clear KPIs and Milestones:**
 - **Positions and engagement:** The company strengthens its external affiliations with global sustainability organizations and aligns its efforts with frameworks like the UN's SDGs. Establish key performance indicators (KPIs) for each ESG priority. This helps measure progress over time. Incorporate both short-term and long-term milestones, ensuring that progress is achievable and quantifiable.
3. **Align ESG with Business Strategy:**

Starting with small, low-cost initiatives like reducing plastic in operations builds internal confidence to scale ESG efforts, positioning the company as a leader in marine conservation.

Integrate ESG activities into core business functions like portfolio strategy, operations, talent management, and performance metrics. Embed ESG goals in decision-making processes to create a lasting impact.
4. **Assign Responsibilities:**

Clearly define roles and responsibilities for each part of the ESG strategy. This includes delegating tasks to different departments and ensuring there is accountability at every stage of the process.
5. **Create a Timeline and Track Progress:**

Develop a timeline that includes short-term and long-term goals for each ESG initiative. Regularly monitor and adjust the roadmap based on performance data and evolving ESG trends.
6. **Review and Adapt:**

Continuously assess progress against your KPIs and adjust the roadmap as necessary to account for changing regulations, stakeholder expectations, or business goals.

HOW TO

1. **Identify Resource Needs:**

Assess which ESG initiatives need funding, personnel, or technological support. Analyze the ESG roadmap and prioritize initiatives that have the greatest impact on sustainability, such as carbon reduction and diversity programs.

2. **Assign Dedicated Personnel:**

Allocate human resources by appointing dedicated ESG professionals, such as sustainability managers, analysts, and project managers. These roles are essential for monitoring initiatives, reporting progress, and aligning efforts across departments.

3. **Allocate Financial Resources:**

Set aside a budget for ESG projects. This budget should include funding for both operational and capital expenditures, such as sustainability initiatives, renewable energy investments, or diversity programs. For companies with limited budgets, prioritizing environmental and social investments over governance may yield the most immediate improvements in ESG scores.

4. **Leverage Technology:**

Invest in technology solutions that support ESG goals, such as data analytics platforms for sustainability tracking or software for improving supply chain transparency.

5. **Monitor and Adjust:**

Continuously monitor the allocation of resources to ensure they are being used effectively. Adjust resource allocation as ESG priorities shift or as projects reach completion to maintain focus on the most critical areas.

Once a company has defined its ESG priorities and strategic roadmap, the next critical step is allocating the resources necessary to implement these initiatives effectively. Resources may include financial budgets, personnel, and technology. Proper resource allocation ensures that the company's environmental, social, and governance (ESG) goals are not only feasible but also sustainable in the long term. Allocating these resources strategically will also enhance the company's ESG performance, positioning it for long-term success.

EXAMPLE

A marine restoration company allocates resources to support its key ESG goals, such as restoring coastal ecosystems and reducing the environmental footprint of restoration methods. The company hires an ESG project manager to oversee restoration projects and an ESG analyst to track sustainability performance. The company allocates a dedicated budget for sustainability initiatives, including the purchase of eco-friendly materials for restoration and investment in renewable energy to power its operations. To monitor ecosystem recovery, the company invests in satellite imagery and data analytics tools that track biodiversity and carbon sequestration in restored areas. By prioritizing environmental and social aspects in its resource allocation, the company enhances its ESG performance, positioning itself as a leader in sustainable marine restoration.

Step 7: Formalize ESG governance and develop policies

The formalization of ESG governance involves establishing clear policies and guidelines that outline how a company will manage its environmental, social, and governance (ESG) responsibilities. Effective governance ensures that ESG initiatives are embedded in the company's daily operations and decision-making processes. It also enhances accountability and transparency in ESG performance, enabling companies to meet both regulatory requirements and stakeholder expectations. The integration of scientific insights into

management decisions also strengthens policymaking and helps achieve broader environmental and developmental goals (Büscher, 2023).

A marine restoration company formalizes its ESG governance by creating a comprehensive set of policies focused on environmental stewardship and social responsibility. It sets up an ESG committee at the board level to oversee the implementation of these policies and ensure that they are integrated into the company's strategy.

- **Policies:** The company develops specific guidelines for responsible sourcing, ensuring that materials used in marine restoration come from sustainable sources. It also adopts a climate action policy aimed at reducing the carbon footprint of restoration projects and sets clear diversity and inclusion goals for its workforce.

HOW TO

1. **Establish ESG Governance Structure:**
Determine which governance framework will best suit the company's size, industry, and goals. Designate a board-level ESG committee or assign specific roles and responsibilities within the organization for managing ESG activities.
Draft clear, actionable policies that align with the company's ESG priorities. These policies should include standards, guidelines, and procedures for managing key issues such as environmental stewardship, social equity, cybersecurity or governance integrity (find a comprehensive list of possible guidelines and templates at "[Brightest](#)").
2. **Develop ESG Policies:**
Draft clear, actionable policies that align with the company's ESG priorities. These policies should include standards, guidelines, and procedures for managing key issues such as environmental stewardship, social equity, cybersecurity or governance integrity (find a comprehensive list of possible guidelines and templates at "[Brightest](#)").
3. **Incorporate ESG into Decision-Making:**
Integrate these policies into the company's decision-making processes at all levels, ensuring that ESG factors are considered in operational planning, risk management, and corporate strategy.
4. **Implement ESG Training:**
Ensure that employees and leaders are trained on ESG policies and understand their role in promoting these values. Establish regular ESG education programs and incorporate ESG-related objectives into performance evaluations.
5. **Monitor and Review Policies:**
Regularly review and update the ESG governance structure and policies to stay aligned with changing regulations and stakeholder expectations.

3. **Set Up Dashboards:**

Implement dashboards to visualize ESG data in real-time. Dashboards offer an easy-to-use interface to track ESG progress and help management teams make data-driven decisions. Ensure dashboards are customizable and aligned with specific ESG goals, providing clear insights into KPIs and trends.

4. **Develop Data Governance Policies:**

Define clear policies for data quality, security, and privacy to ensure compliance with regulations and safeguard data integrity. Ensure that data collection processes meet the required standards for accuracy and reliability.

5. **Ensure Accessibility and Reporting:**

Set up systems to allow key stakeholders access to ESG performance data. This transparency strengthens stakeholder trust and engagement.

Step 8: Establish ESG data systems, dashboards, and processes

To accurately track and report on ESG performance, companies must implement robust data systems and processes. This step is essential for gathering high-quality, reliable ESG data that meets the expectations of investors, rating agencies, and stakeholders. A well-structured data system provides visibility into key performance indicators (KPIs) and benchmarks while ensuring that the company's ESG efforts are measurable, transparent, and continuously improving. Companies must integrate internal data (such as KPIs), adopt advanced tools for data collection and reporting, and ensure compliance with industry standards to improve accuracy, data governance, and transparency.

HOW TO

1. **Create a Data Inventory:**

Identify the ESG data that needs to be tracked, including internal KPIs, operational metrics, and industry benchmarks to ensure that the most relevant and impactful data is collected for analysis and reporting. Include data from internal systems, benchmarks, and industry standards to ensure comprehensive tracking.

2. **Adopt Data Systems:**

Transition from manual or spreadsheet-based systems to more specialized ESG reporting tools. Use software such as [Quickbooks](#) or [Oracle NetSuite](#) to efficiently track and manage ESG data. These systems improve accuracy, enhance efficiency, and ensure better data governance practices.

HOW TO

1. **Track ESG KPIs:**

Develop a system for regular monitoring of key ESG metrics using real-time dashboards and automated data to track targets like carbon reduction, diversity, and waste management. Benchmark KPIs against industry standards and review them to align with evolving goals and regulations.

2. **Enhance Disclosure:**

Enhance ESG reporting by regularly updating stakeholders on company performance. Use frameworks like Global Reporting Initiative (GRI) or Sustainability Accounting Standards Board (SASB) for transparent disclosures, and provide concise reports covering key ESG metrics and their impact on business performance, making information accessible for investors and stakeholders.

3. **Develop a Long-Term Plan:**

Develop a strategic plan to improve ESG ratings through initiatives like enhancing energy efficiency, reducing emissions, and increasing workforce diversity. Ensure the plan remains adaptable to new challenges and opportunities, with a focus on measurable, impactful ESG progress.

4. **Leverage Data Analytics:**

Utilize advanced data analytics and technology to identify trends, anticipate risks, and adjust strategies as needed. This approach enables companies to make informed, real-time decisions that enhance their ESG performance.

5. **Engage with Stakeholders:**

Foster ongoing dialogue with investors, employees, and communities to gather feedback on ESG performance and expectations. By aligning the company's efforts with stakeholder concerns, long-term sustainability goals are more easily met.

practices, they can often gain competitive advantages and improve operational efficiency, leading to positive returns on investment.

EXAMPLE

A marine restoration company focused on protecting coral reefs tracks KPIs related to ecosystem recovery, such as the survival rate of planted coral species and improvements in local water quality. In addition to ecological metrics, the company monitors economic and social benefits in coastal communities, such as job creation and tourism revenue, through both market and non-market valuation methods. By using integrated ecological and social data, the company continuously updates its ESG reports, demonstrating both environmental impact and community engagement. This comprehensive approach not only boosts transparency but also contributes to the company's long-term success and enhances its ESG ratings.

3. Evaluation Framework

This chapter introduces an Evaluation Framework designed to guide self-assessment and progress tracking for marine restoration projects through a decision tree (DT) approach. A decision tree is a step-by-step tool that helps users navigate complex decisions by posing questions at each step; it's particularly effective for self-assessment because it provides a clear, structured pathway, helping users identify what's complete and what still needs attention. Therefore, in this framework, each step in the decision tree asks whether a specific milestone or requirement has been met. If so, the process moves to the next step. If not, the user is directed to complete the current step before proceeding, ensuring thorough evaluation and readiness before advancing.

Later, the framework will be made available as an online tool and in PowerPoint format for ease of use and accessibility. This approach empowers users to systematically evaluate their project's progress, making it a practical tool for both planning and review.

3.1 Demand Readiness Level Evaluation

This decision tree aims to identify the current Demand Readiness Level. Each question narrows down the possible steps based on the progress in identifying, defining, and addressing the need or problem.

1. **Is there an informal, unstructured recognition of a potential need or problem, without a clear understanding of what is needed?**

Explanation: This means you have a general feeling that something is missing, or a problem exists, but you haven't yet figured out exactly what is needed to address it.

Yes → Proceed to the next question.

No → Start with Step 1: Occurrence of feeling "something is missing."

2. **Is there a specific need identified, but it's not yet explored or defined in detail?**

Explanation: This means you know what the problem or need is, but you haven't yet detailed how to solve it or what exactly is required.

Yes → Proceed to the next question.

No → You are at Step 1: Occurrence of feeling "something is missing."
→ Proceed to Step 2: Identification of a specific need.

3. **Are the expected functionalities for a new product or service outlined?**

Explanation: This means you have a clear idea of what features or capabilities the new product or service should have to meet the identified need.

Yes → Proceed to the next question.

No → You are at Step 2: Identification of a specific need.

→ Proceed to Step 3: Identification of the expected functionalities for a new product or service.

4. **Are the functionalities quantified with specific, measurable targets?**

Explanation: This means you have set specific, measurable goals for the features or capabilities identified in the previous step.

Yes → Proceed to the next question.

No → You are at Step 3: Identification of the expected functionalities for a new product or service.

→ Proceed to Step 4: Quantification of expected functionalities.

5. **Are the complete system capabilities needed to meet the quantified functionalities identified?**

Explanation: This means you have determined all the technical, operational, and functional requirements needed to achieve the set goals.

Yes → Proceed to the next question.

No → You are at Step 4: Quantification of expected functionalities.

→ Proceed to Step 5: Identification of system capabilities.

6. **Are the expected functionalities translated into specific, practical requirements and an actionable plan?**

Explanation: This means you have created a detailed plan that translates the identified capabilities into concrete steps and resources needed for implementation.

Yes → Proceed to the next question.

No → You are at Step 5: Identification of system capabilities.

→ Proceed to Step 6: Translation of the expected functionalities into needed capabilities to build the response.

7. **Are the necessary and sufficient competences and resources defined and secured?**

Explanation: This means you have identified and obtained all the skills, expertise, and resources required to develop and deploy the solution.

Yes → Proceed to the next question.

No → You are at Step 6: Translation of the expected functionalities into needed capabilities to build the response.

→ Proceed to Step 7: Definition of the necessary and sufficient competences and resources.

8. Are experts with the required competences identified and assembled?

Explanation: This means you have found and brought together the people with the necessary skills and knowledge to work on the project.

Yes → Proceed to the next question.

No → You are at Step 7: Definition of the necessary and sufficient competences and resources.

→ Proceed to Step 8: Identification of experts possessing the competences.

9. Is the solution that directly addresses the identified needs developed and finalized?

Explanation: This means you have integrated all the capabilities, competences, and resources to create a final product, service, or system that meets the market need.

Yes → You completed the last step of the Demand Readiness Level.

→ Go ahead to the Technical Readiness Level and Business Readiness Level.

No → You are at Step 8: Identification of experts possessing the competences.

→ Proceed to Step 9: Building the adapted answer to the expressed need in the market.

→ For your reference: Go ahead to the Technical Readiness Level and Business Readiness Level.

3.2 Technical Readiness Level Evaluation

This decision tree aims to identify the current Technical Readiness Level. Each question narrows down the possible steps based on the progress in identifying, defining, and addressing the need or problem.

1. **Have you conducted foundational research to identify fundamental properties and principles?**

Explanation: This question checks if you've explored and understood the basic scientific principles underlying your technology.

Yes: → Proceed to the next question.

No: → Start with Step 1: Study, discover, and set basic assumptions.

2. **Have you developed and defined practical applications or technology concepts based on these fundamental principles?**

Explanation: This question ensures you've moved from basic research to defining how these principles can be applied in practice.

Yes: → Proceed to the next question.

No: → You are at Step 1: Study, discover, and set basic assumptions.
→ Proceed to Step 2: Create concepts of technology and/or apply technology formulas.

3. **Have you begun analyzing and experimenting with core functions or proving key elements of your concept?**

Explanation: This question checks whether you've started testing and validating the core functions of your technology.

Yes: → Proceed to the next question.

No: → You are at Step 2: Create concepts of technology and/or apply technology formulas
→ Proceed to Step 3: Analyze and experiment core functions and/or prove key elements of the concept.

4. **Have you tested key components of the technology in controlled laboratory conditions?**

Explanation: This question determines if you've moved from initial concept validation to testing specific components in the lab. However, if lab testing is not feasible, click "Yes".

Yes: → Proceed to the next question.

No: → You are at Step 3: Analyze and experiment core functions and/or prove key elements of the concept.
→ Proceed to Step 4: Test key components in laboratory conditions.

5. Have you extended testing of these components to real-world or simulated environments beyond the lab?

Explanation: This question checks whether you've tested the technology outside the controlled lab environment, in real-world or simulated conditions.

Yes: → Proceed to the next question.

No: → You are at Step 4: Test key components in laboratory conditions.
→ Proceed to Step 5: Extend the key component test from laboratory to other relevant circumstances.

6. Have you tested models of the core system and subsystems in relevant real-world or simulated conditions?

Explanation: This question ensures you've progressed to testing integrated system models in relevant conditions.

Yes: → Proceed to the next question.

No: → You are at Step 5: Extend the key component test from laboratory to other relevant circumstances.
→ Proceed to Step 6: Test models of core system and subsystems or models in relevant circumstances.

7. Have you tested a full prototype in real-world field conditions?

Explanation: This question checks if you've tested a full prototype in real-world scenarios to assess its readiness.

Yes: → Proceed to the next question.

No: → You are at Step 6: Test models of core system and subsystems or models in relevant circumstances.
→ Proceed to Step 7: Test prototype in field.

8. Have you completed the product certification to meet all required standards and regulations?

Explanation: This question ensures you've obtained necessary certifications to confirm the technology's safety and compliance.

Yes: → Proceed to the next question.

No: → You are at Step 7: Test prototype in field.
→ Proceed to Step 8: Complete product certification.

9. Is your technology finalized, ready for delivery, and prepared for deployment in its intended environment?

Explanation: This final question confirms that your technology is ready for widespread application, having passed all necessary tests and certifications.

- Yes: → You are at Step 9: Ready to be delivered and used.
→ Your technology is fully prepared for deployment and operation.
- No: → You are at Step 8: Complete product certification.
→ Proceed to Step 9: Ready to be delivered and used.

3.3 Business Readiness Level Evaluation

This decision tree is designed to help you evaluate your current Business Readiness Level (BRL). Each step narrows down the level of readiness based on team formation, business model development, and operational readiness. Answer the questions below to determine where your business stands and what actions are needed to progress.

1. **Have you gathered people—potential founders, investors, or collaborators—with common interests?**

Explanation: This question checks if you've established a foundational team of individuals who share your vision and complement your skills.

Yes: → Proceed to the next question.

No: → Start with Step 1: Gather people—potential founders and investors—with common interests.

2. **Have you completed the first pass of the Business Model Canvas to define your business structure?**

Explanation: This question checks if you've outlined the key elements of your business using the Business Model Canvas.

Yes: → Proceed to the next question.

No: → You are at Step 1: Gather your team.

→ Proceed to Step 2: Complete the first pass Business Model Canvas.

3. **Have you identified the products and services your business will offer and sought initial funding?**

Explanation: This question ensures you've identified what your business will sell and have explored options for seed funding.

Yes: → Proceed to the next question.

No: → You are at Step 2: Complete the Business Model Canvas.

→ Proceed to Step 3: Identify forms of products/services and seek seed funding.

4. **Have you tested your basic business assumptions and revenue model in the real world?**

Explanation: This question checks if you've validated the key assumptions of your business model through testing.

Yes: → Proceed to the next question.

No: → You are at Step 3: Identify your products and seek funding.

→ Proceed to Step 4: Test basic assumptions of your business and revenue model.

5. Have you determined the essential investment requirements using an investment readiness evaluation?

Explanation: This question checks if you've assessed how much investment is necessary to proceed to the next level.

Yes: → Proceed to the next question.

No: → You are at Step 4: Test basic assumptions.
→ Proceed to Step 5: Determine essential investment using the investment readiness level.

6. Have you planned and prepared the necessary financing to secure investment?

Explanation: This question determines if you've formulated a clear investment and financing plan.

Yes: → Proceed to the next question.

No: → You are at Step 5: Determine essential investment needs.
→ Proceed to Step 6: Plan and prepare investment and financing.

7. Is your business ready for full-scale operations, including product development, supply chain, and marketing?

Explanation: This question checks if you've prepared all essential business functions for operational readiness.

Yes: → Proceed to the next question.

No: → You are at Step 6: Plan and prepare financing.
→ Proceed to Step 7: Prepare for designed business operation.

8. Have you started operating your business and ensuring the viability of your business model in real-world conditions?

Explanation: This question checks if your business has begun operations and is sustaining itself in a competitive environment.

Yes: → Proceed to the next question.

No: → You are at Step 7: Prepare for full business operation.
→ Proceed to Step 8: Operate to ensure the viability of the designed business model.

9. Have you adapted your business model to overcome problems and stay competitive?

Explanation: This question checks if you've refined your business model to address challenges and ensure competitiveness.

Yes: → Proceed to the next question.

No: → You are at Step 8: Operate your business.

→ Proceed to Step 9: Adapt to overcome problems to compete with other businesses.

10. Are you achieving sustainable growth and on track to becoming an industry leader?

Explanation: This question checks if your business is experiencing sustainable growth and progressing toward industry leadership.

Yes: → Proceed to the next question.

No: → You are at Step 9: Adapt your business model.

→ Proceed to Step 10: Attain sustainable growth and be recognized as an industry leader.

11. Is your business growth comparable to the industry standard?

Explanation: This final question ensures that your business is maintaining growth at or above the industry standard, ensuring long-term sustainability.

Yes: → You are at Step 11: Maintain business growth. Your business is well-positioned for long-term success.

No: → You are at Step 10: Attain sustainable growth.

→ Proceed to Step 11: Maintain business growth comparable to the industry standard.

3.4 Commercial Readiness Level Evaluation

This tree guides businesses through evaluating their commercial readiness, from concept to full-scale commercialization. Each step highlights critical decisions and processes needed to advance to the next stage.

1. **Have you determined your basic commercial assumptions, such as target customers?**

Explanation: Assess the feasibility of your product through market research and customer profiling.

Yes: → Proceed to the next question.

No: → Start with Step 1: Conduct market research and customer segmentation to identify target customer groups.

2. **Have you identified a unique selling proposition (USP) for your product?**

Explanation: A compelling USP communicates key benefits that differentiate your product in the market.

Yes: → Proceed to the next question.

No: → You are at Step 1: Conduct market research and customer segmentation to identify target customer groups.

→ Proceed to Step 2: Develop a USP that highlights how your offering solves a specific problem better than competitors.

3. **Have you analyzed the details of your target market and pricing strategy?**

Explanation: Refine your understanding of the market and develop a pricing strategy that covers costs and ensures profitability.

Yes: → Proceed to the next question.

No: → You are at Step 2: Develop a USP that highlights how your offering solves a specific problem better than competitors.

→ Proceed to Step 3: Analyze your target market and create a pricing strategy.

4. **Have you tested market acceptance of your concept?**

Explanation: Understanding socio-political, community, and market acceptance is crucial before a full market launch.

Yes: → Proceed to the next question.

No: → You are at Step 3: Analyze your target market and create a pricing strategy.

→ Proceed to Step 4: Test market acceptance and gather feedback.

5. **Are you prepared for commercial operation?**

Explanation: Ensure all business elements are aligned for a successful market launch.

Yes: → Proceed to the next question.

No: → You are at Step 4: Test market acceptance and gather feedback.
→ Proceed to Step 5: Prepare your business plan, financial management, and marketing strategies.

6. Have you delivered commercial applications successfully?

Explanation: Implement strategies to effectively market and distribute your product to customers.

Yes: → Proceed to the next question.

No: → You are at Step 5: Prepare your business plan, financial management, and marketing strategies.
→ Proceed to Step 6: Focus on delivering commercial applications and ensuring customer qualification.

7. Have you planned for competition and scaling up your customer base?

Explanation: Decide on scaling strategies based on your business size and customer demographics.

Yes: → Proceed to the next question.

No: → You are at Step 6: Focus on delivering commercial applications and ensuring customer qualification.
→ Proceed to Step 7: Plan your approach to competition and scaling the customer base.

8. Are you creating business extensions to maximize commercial benefits?

Explanation: Focus on enhancing internal capabilities and diversifying your offerings to achieve growth.

Yes: → Your business is well-positioned for long-term success!

No: → You are at Step 7: Plan your approach to competition and scaling the customer base.
→ Proceed to Step 8: Develop strategies for business extension and stakeholder engagement.

3.5 Regulatory Readiness Level Evaluation

This decision tree is designed to help evaluate your current Regulatory Readiness Level (RRL). Each step focuses on key stages of regulatory preparedness, guiding you through the lifecycle of your innovation or product, from conceptualization to post-market surveillance.

1. **Have you defined and reviewed the target market of the innovation/technology?**

Explanation: This step checks if you've understood the regulatory landscape of the target market, including varying regulations that may affect your product.

Yes: → Proceed to the next question.

No: → Start with Step 1: Define and review the target market of the innovation/technology.

2. **Have you reviewed and agreed on the classification and regulatory strategy?**

Explanation: This step ensures that you have a regulatory strategy in place, defining necessary steps for compliance and aligning with business objectives.

Yes: → Proceed to the next question.

No: → You are at Step 1: Define and review the target market.
→ Proceed to Step 2: Review and agree on the classification and regulatory strategy.

3. **Have you established the intended use and key performance indicators (KPIs) for your product?**

Explanation: Understanding intended use and KPIs is essential for regulatory submissions and ensuring the product meets customer and regulatory expectations.

Yes: → Proceed to the next question.

No: → You are at Step 2: Review and agree on regulatory strategy.
→ Proceed to Step 3: Establish intended use and KPIs.

4. **Have you created a plan of required regulatory submissions and established an implementation plan?**

Explanation: This step ensures that your submission and implementation plan is in place, compliant with the required regulations, and aligned with your product lifecycle.

Yes: → Proceed to the next question.

No: → You are at Step 3: Establish intended use and KPIs.
→ Proceed to Step 4: Plan regulatory submissions and create an implementation plan.

5. Have you contacted regulators and established mechanisms for applicable regulations and standards?

Explanation: This step is about ensuring you have mechanisms to comply with standards, and that regulators are aware of your product development.

Yes: → Proceed to the next question.

No: → You are at Step 4: Plan regulatory submissions.

→ Proceed to Step 5: Contact regulators and establish processes for regulations and standards.

6. Have you completed initial regulatory submissions and outlined an evaluation plan?

Explanation: This step ensures that initial submissions are made and a plan for evaluating the product's compliance is in place.

Yes: → Proceed to the next question.

No: → You are at Step 5: Establish processes for regulations and standards.

→ Proceed to Step 6: Complete regulatory submissions and outline an evaluation plan.

7. Have you prepared the Quality Management System (QMS) certification and the technical file?

Explanation: The QMS certification and technical documentation are critical to demonstrate compliance with safety, health, and environmental standards.

Yes: → Proceed to the next question.

No: → You are at Step 6: Complete regulatory submissions.

→ Proceed to Step 7: Prepare QMS certification and technical file.

8. Have you submitted regulatory documents and received market approval?

Explanation: After meeting the necessary regulatory requirements, the next step is submitting the documents to obtain market approval.

Yes: → Proceed to the next question.

No: → You are at Step 7: Prepare QMS certification.

→ Proceed to Step 8: Submit regulatory documents and receive market approval.

9. Have you implemented post-market surveillance (PMS) and vigilance reporting?

Explanation: This step checks if you are actively monitoring the product's performance post-market and reporting any issues to regulators.

Yes: → Your product is fully compliant and regulatory-ready.

No: → You are at Step 8: Submit regulatory documents.

→ Proceed to Step 9: Implement post-market surveillance and reporting.

3.6 Acceptance Readiness Level Evaluation

This decision tree will assist in evaluating your current Acceptance Readiness Level (ARL). Each step assesses societal acceptance based on legal, ethical, and social standards. Answer the questions below to determine your product's ARL status and identify actions needed to improve acceptance.

1. Is the product seen as illegitimate or socially unacceptable?

Explanation: This question checks if the product breaches any laws, poses risks, misleads consumers, or engages in unethical practices, all of which affect its legitimacy and societal acceptance.

Yes: → Proceed to the next question.

No: → Start with Step 1: Address the foundational issues impacting legitimacy or social acceptability, ensuring compliance with laws and ethical standards.

2. Is the product controversial among large parts of the population?

Explanation: This question evaluates whether the product causes societal debate or concern. Controversial products often evoke strong opinions and require specific communication strategies.

Yes: → Proceed to the next question.

No: → You are at Step 1: Address the foundational issues impacting legitimacy or social acceptability, ensuring compliance with laws and ethical standards.
→ Proceed to Step 2: Develop strategies to address public concerns through transparent communication, stakeholder engagement, and education initiatives.

3. Is the product seen as questionable among groups of the population?

Explanation: This question identifies if the product raises ethical or practical concerns within specific segments of the population, even if not broadly controversial.

Yes: → Proceed to the next question.

No: → You are at Step 2: Develop strategies to address public concerns through transparent communication, stakeholder engagement, and education initiatives.
→ Proceed to Step 3: Address specific group concerns through targeted outreach, highlighting ethical considerations and potential benefits.

4. Is the product seen as questionable by key actors in the sector?

Explanation: Key actors (e.g., industry leaders, regulatory agencies, or sector stakeholders) influence acceptance and credibility within the industry. This question assesses whether these actors view the product as acceptable.

Yes: → Proceed to the next question.

No: → You are at Step 3: Address specific group concerns through targeted outreach, highlighting ethical considerations and potential benefits.
→ Proceed to Step 4: Engage with key actors to address concerns, ensuring alignment with industry standards and credibility.

5. Is the use of the product seen as questionable within marginal interest groups?

Explanation: This question checks if specialized groups or niche advocates have concerns about the product's use, which could affect its reputation in niche markets.

Yes: → Proceed to the next question.

No: → You are at Step 4: Engage with key actors to address concerns, ensuring alignment with industry standards and credibility.

→ Proceed to Step 5: Work with these groups to understand and mitigate concerns, improving reputation within specific communities.

6. Is the use and production of the product socially not accepted in general?

Explanation: This final question determines if the product is broadly accepted or if societal norms, values, or ethical standards challenge its use and production.

Yes: → You are at Step 6: Address broad societal concerns by reevaluating the product's impact and ensuring its alignment with public expectations and ethical standards.

→ Proceed with the Societal Readiness Level.

No: → You are at Step 5: Work with these groups to understand and mitigate concerns, improving reputation within specific communities.

→ Proceed to Step 6: Address broad societal concerns by reevaluating the product's impact and ensuring its alignment with public expectations and ethical standards.

3.7 Societal Readiness Level Evaluation

This decision tree will guide you through the steps of evaluating Societal Readiness Level (SRL). Each stage assesses societal impact based on problem identification, stakeholder involvement, and adaptation planning, helping you track readiness and actions needed to achieve societal alignment and impact.

1. Have you identified the root causes of the societal, environmental, or economic issue your solution addresses?

Explanation: Identifying core issues lays the foundation for relevant, impactful solutions. This step involves gathering data and understanding stakeholder perspectives to ensure problem alignment.

Yes: → Proceed to the next question.

No: → Start with Step 1: Define the root causes of the issue.

2. Have you created a concept with potential for (sub)systemic change?

Explanation: Concepts aimed at societal impact should balance innovation with practicality, integrating sustainability principles and societal alignment.

Yes: → Proceed to the next question.

No: → You are at Step 1: Define the root causes of the issue.

→ Proceed to Step 2: Develop a concept that can drive meaningful change.

3. Have you proposed actionable solutions and identified relevant stakeholders?

Explanation: This step involves crafting detailed solutions with potential impact, as well as recognizing key stakeholders who can provide feedback and guide solution refinement.

Yes: → Proceed to the next question.

No: → You are at Step 2: Develop a concept that can drive meaningful change.

→ Proceed to Step 3: Define actionable solutions and identify relevant stakeholders.

4. Have you conducted initial testing of the proposed solution with stakeholders?

Explanation: Testing in a controlled environment helps identify issues early on and improves solution relevance by aligning with stakeholder expectations and environmental goals.

Yes: → Proceed to the next question.

No: → You are at Step 3: Define actionable solutions and identify relevant stakeholders.

→ Proceed to Step 4: Engage stakeholders for initial testing.

5. Have you validated the problem through pilot testing in relevant environments?

Explanation: Pilot testing validates the solution's societal relevance and identifies additional areas for improvement, building the bridge from concept to real-world application.

Yes: → Proceed to the next question.

No: → You are at Step 4: Engage stakeholders for initial testing.

→ Proceed to Step 5: Pilot test the solution to confirm problem relevance.

6. Have you validated the proposed solution with a broader group of stakeholders?

Explanation: Expanding validation ensures that the solution is effective and socially accepted across various stakeholder groups, paving the way for implementation.

Yes: → Proceed to the next question.

No: → You are at Step 5: Pilot test the solution to confirm problem relevance.

→ Proceed to Step 6: Validate with a wider range of stakeholders.

7. Have you demonstrated the solution in a realistic environment and gathered extensive feedback?

Explanation: Testing in a realistic environment, with broad stakeholder engagement, helps refine the solution to align with societal needs and expectations.

Yes: → Proceed to the next question.

No: → You are at Step 6: Validate with a wider range of stakeholders.

→ Proceed to Step 7: Demonstrate the solution in a relevant setting.

8. Have you refined the solution and created a societal adaptation plan?

Explanation: Refining the solution based on real-world insights ensures societal relevance, while a societal adaptation plan facilitates smooth integration into the intended community or industry.

Yes: → Proceed to the next question.

No: → You are at Step 7: Demonstrate the solution in a relevant setting.

→ Proceed to Step 8: Refine the solution and develop an adaptation plan.

9. Have you finalized the solution and adaptation plan for societal implementation?

Explanation: Finalizing the solution and creating an adaptation roadmap ensures the solution can be smoothly integrated into the target society, ready for market entry.

Yes: → Proceed to the next question.

No: → You are at Step 8: Refine the solution and develop an adaptation plan.

→ Proceed to Step 9: Finalize the solution and societal adaptation plan.

10. Have you implemented the solution in the target environment?

Explanation: This phase assesses real-world performance, addressing adjustments needed to meet societal expectations and ensure ongoing relevance.

Yes: → Proceed to the next question.

No: → You are at Step 9: Finalize the solution and societal adaptation plan.

→ Proceed to Step 10: Implement the solution in the target environment.

11. Have you documented outcomes and lessons learned?

Explanation: Documenting implementation insights supports long-term success and provides valuable information for similar projects.

Yes: → Congratulations! Your solution is well-prepared for societal readiness and long-term sustainability.

No: → You are at Step 10: Implement the solution in the target environment.

→ Proceed to Step 11: Document outcomes and gather lessons learned.

3.8 ESG Readiness Level Evaluation

This decision tree will guide you through the steps of evaluating Environmental, Social, and Governance Readiness Level (ESGRL). Each stage assesses essential aspects of ESG integration, from readiness and stakeholder engagement to strategy development and sustainable implementation.

1. Have you conducted an ESG readiness and resources assessment?

Explanation: This initial assessment examines your current ESG practices, resources, and risks. Raising internal awareness about ESG's importance for sustainable business success and conducting a gap analysis helps identify strengths, weaknesses, and key processes.

Yes: → Proceed to the next question.

No: → Start with Step 1: Conduct a readiness assessment and identify ESG strengths and weaknesses.

2. Have you completed a materiality analysis to prioritize ESG issues?

Explanation: Materiality analysis aligns ESG issues with business and stakeholder priorities, highlighting critical topics for reporting and strategy. This analysis builds a foundation for integrating ESG into decision-making by identifying high-impact areas.

Yes: → Proceed to the next question.

No: → You are at Step 1: Conduct a readiness assessment and identify ESG strengths and weaknesses.
→ Proceed to Step 2: Conduct a materiality analysis.

3. Have you engaged key ESG stakeholders?

Explanation: Engaging stakeholders (e.g., employees, investors, communities) aligns ESG strategies with their concerns, ensuring the company's efforts are collaborative, transparent, and responsive.

Yes: → Proceed to the next question.

No: → You are at Step 2: Conduct a materiality analysis.
→ Proceed to Step 3: Engage stakeholders for feedback.

4. Have you integrated ESG into your business strategy?

Explanation: Integrating ESG factors into the core business strategy aligns socio-environmental impacts with financial returns, fostering resilience and generating value for stakeholders.

Yes: → Proceed to the next question.

No: → You are at Step 3: Engage stakeholders for feedback.
→ Proceed to Step 4: Integrate ESG into your business strategy.

5. Have you defined top ESG priorities and created a strategic roadmap?

Explanation: Defining priorities and establishing a roadmap sets clear guidelines, timelines, and responsibilities, enabling focused, measurable progress in ESG implementation.

Yes: → Proceed to the next question.

No: → You are at Step 4: Integrate ESG into your business strategy.
→ Proceed to Step 5: Define top ESG priorities and create a roadmap.

6. Have you allocated resources to your ESG priorities?

Explanation: Resource allocation—covering budgets, personnel, and technology—ensures the feasibility and long-term sustainability of ESG goals, enhancing the overall ESG performance.

Yes: → Proceed to the next question.

No: → You are at Step 5: Define top ESG priorities and create a roadmap.
→ Proceed to Step 6: Allocate resources for ESG initiatives.

7. Have you formalized ESG governance and developed policies?

Explanation: Establishing clear ESG policies embeds initiatives into daily operations, increasing accountability and aligning practices with stakeholder and regulatory expectations.

Yes: → Proceed to the next question.

No: → You are at Step 6: Allocate resources for ESG initiatives.
→ Proceed to Step 7: Formalize ESG governance and policies.

8. Have you established ESG data systems, dashboards, and processes?

Explanation: Implementing data systems is crucial for tracking ESG performance metrics, enhancing transparency, and aligning with stakeholder and regulatory standards.

Yes: → Proceed to the next question.

No: → You are at Step 7: Formalize ESG governance and policies.
→ Proceed to Step 8: Establish ESG data systems and dashboards.

9. Are you tracking ESG KPIs, improving disclosures, and working on a long-term plan to increase your ESG rating?

Explanation: Continuous monitoring and transparent reporting align ESG goals with long-term strategy, promoting adaptability and enhancing competitive advantage.

Yes: → Congratulations! Your solution is well-prepared for sustainable ESG implementation.

No: → You are at Step 8: Establish ESG data systems and dashboards.
→ Proceed to Step 9: Track KPIs, improve disclosures, and develop a long-term ESG improvement plan.

4. Summary

The *Market Readiness and Societal Value Evaluation Frameworks* deliverable provides a comprehensive guide for innovators, businesses, start-ups, and investors engaged in marine restoration projects. These frameworks are designed to assess the readiness and impact of sustainable technologies, offering practical tools to navigate the complex pathways from project concept to market entry and long-term success.

The deliverable is structured into two main components.

The Readiness Level Guidelines outline specific stages of development, from idea generation and prototyping to commercialization and scaling. Each level offers step-by-step guidance tailored to the unique demands of marine restoration, incorporating best practices, regulatory insights, and examples of real-world applications to ensure robust project progression.

The Evaluation Framework complements these guidelines, providing a decision tree tool for self-assessment. This tool enables users to systematically review each stage, identifying milestones, tracking progress, and ensuring thorough preparation before moving to the next phase. Available in both an online tool and PowerPoint format, the framework makes self-evaluation accessible and practical for diverse stakeholders, from project managers and researchers to policymakers.

By integrating market readiness and societal value considerations, these frameworks support marine restoration initiatives that are not only technically sound but also ecologically and socially aligned. Ultimately, this deliverable aims to enhance the success of sustainable marine technologies, fostering informed decision-making and readiness at every project stage.

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