

Co-developed gamification

Promoting understanding, fostering a sense of responsibility, driving behavioural change

Serious gameplay role

Co-Creation

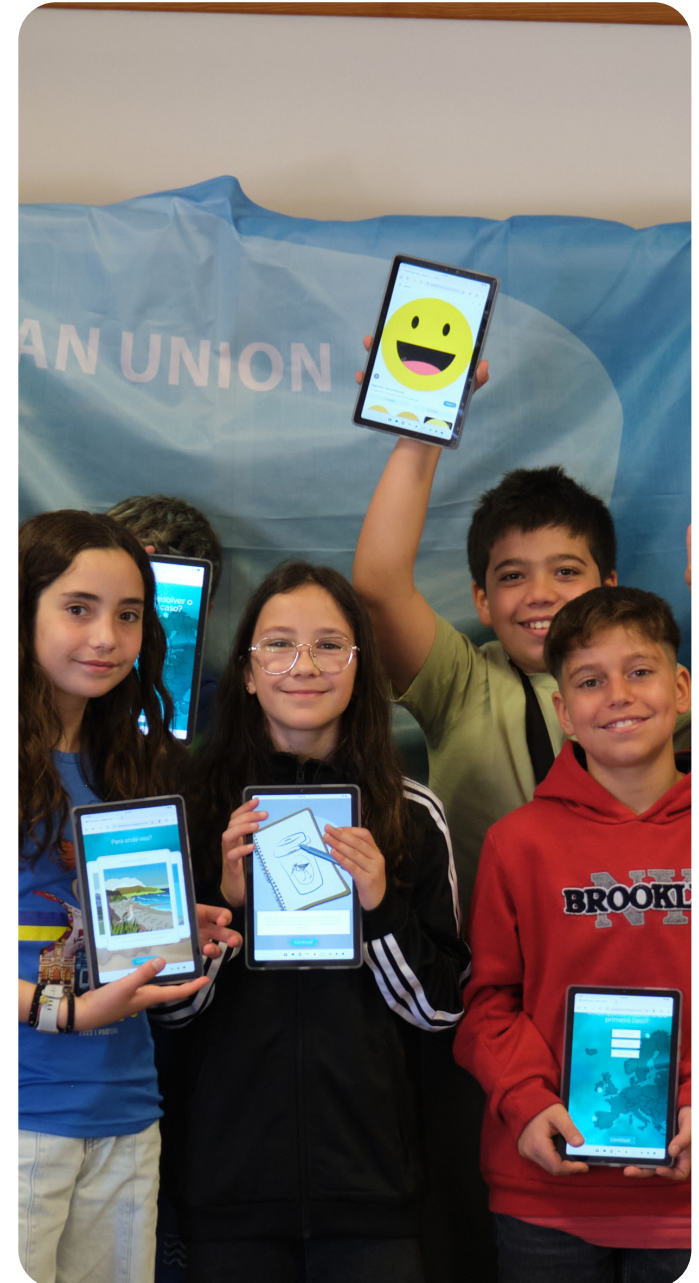


Policy Collective Action

Social cohesion

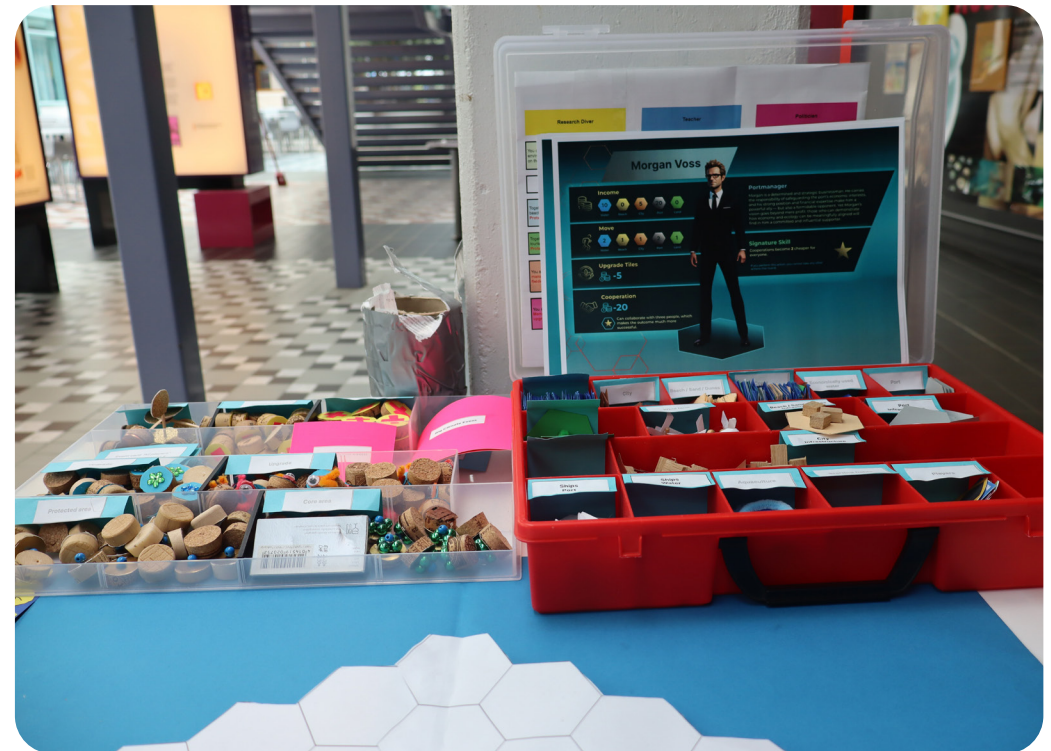
Solution Rational

Coastal and marine socio-ecological systems face interconnected challenges, including biodiversity loss, climate-related risks, and increasing pressures from multiple human activities. Responding to these challenges requires approaches that combine scientific evidence, policy objectives, and the local perspectives, knowledge, and values held by communities and their stakeholders. Because these challenges involve complex interactions and long-term consequences, traditional consultation methods, while essential, can be limited in how much complexity they can convey or how deeply they engage participants. Through a **Living Lab**, stakeholders can come together in a real-world setting to co-develop and experiment with solutions. The approach supports active involvement, ongoing learning, and iterative improvement. **Serious Gaming** (the use of game-based techniques for learning, engagement, and decision support) complements these approaches by providing tools that make complexity easier to understand, create a safe space for experimentation, and enable stakeholders to explore possible solutions collaboratively and transparently. Through interactive, scenario-based play, Serious Gaming help participants experience ecosystem processes, consider trade-offs between different actions, and discuss, for example, potential Nature-based Solutions (NbS). By letting people experiment with decisions and observe their consequences, they foster systems thinking, improve communication across stakeholder groups, and support more informed and collaborative decision-making.



What is this innovative solution?

This innovative solution combines Serious Gaming with a Living Lab approach to create an interactive, collaborative way for stakeholders to understand complex issues and make more inclusive, informed, and policy-relevant decisions. Implementing it involves developing interactive games that mirror local ecological, social, and governance realities, including relevant policy objectives and management and environmental constraints. Participants take on roles, make decisions, and experience the consequences of different choices, helping them engage with real policy trade-offs in a safe, exploratory environment. These games are co-designed with stakeholders, drawing on scientific evidence, policy priorities, and local knowledge to ensure relevance and realism. The solution requires assembling a diverse and representative group of participants, preparing game tools and scenarios, and facilitating iterative sessions where insights from gameplay feed back into planning, dialogue, and policy discussions.



The Benefits the solution produces – data on school intervention & user stats

“We are proud to announce that by the end of 2025 the A-AAGORA Mini Game has been accessed from 38 countries world-wide. Highlights are surely the presentations on the One Ocean Science Congress in Nice and at the Expo 2025 in Osaka.”

Dennis Nissen, CEO naymspace

Applying Serious Gaming fosters an engaging environment where communities, scientists, and policymakers can actively explore challenges, experiment with strategies, and work together to identify effective solutions. The game-based approach brings science, policy, and community perspectives to life, helping participants understand how their decisions shape ecosystems and future outcomes, without any real-world risk. This strengthens communication, builds trust, and creates a shared sense of purpose among communities, scientists, and policymakers. By seeing the “big picture” and experimenting with different strategies, participants become more confident, creative, and solution oriented. The process helps identify common ground, supports informed dialogue, and inspires collective action. It encourages communities to take an active role in restoration efforts, explore Nature-based Solutions, and co-develop innovative pathways for climate resilience and sustainable coastal management. Overall, the solution accelerates learning, improves decision-making, and supports more inclusive, transparent, and resilient planning processes.

Key Benefits Include (i) scientific and social, (ii) governance and Key Benefits Include (i) scientific and social, (ii) governance and decision making, and (iii) educational and engagement aspects:

- Deepens understanding of complex socio-ecological systems and their dynamics
- Promotes shared learning across science, policy, and community groups
- Encourages systems thinking and positive behavioural change
- Builds social cohesion and empowers communities to participate actively in environmental decision-making
- Strengthens transparency and collaboration among stakeholders
- Serves as a neutral, shared reference point for dialogue across interests
- Supports inclusive, evidence-based, and forward-looking planning
- Makes complex restoration and management processes more accessible and engaging
- Promotes mutual understanding and shared learning among participants
- Raises awareness of sustainability challenges and opportunities
- Motivates ongoing community involvement and long-term stewardship



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How developed is the solution

- **Co-development process:** Serious Gaming solutions for complex socio-ecological systems are typically developed through an iterative, participatory process. This begins with defining objectives and designing the game, including scenarios, rules, roles, narratives, and feedback mechanisms that reflect real-world challenges. Workshops with stakeholders, expert input, and user testing are used to ensure that both the game content and mechanics are relevant, credible, and engaging. The co-development process also includes iterative refinement of the game, adjusting scenarios, interactions, and outcomes based on participant experiences and insights. This allows the games to evolve continuously in response to real-world needs, learning objectives, and stakeholder priorities.
- **The games themselves:** Functional prototypes of the games, ranging from simple paper or board versions to fully digital formats, should exist and have been tested in realistic, participatory settings. These games allow stakeholders to explore scenarios, make decisions, and observe potential outcomes, while demonstrating scientific accuracy, usability, and engagement. By iteratively refining the games, designers ensure they effectively convey ecosystem processes, policy constraints, and stakeholder trade-offs.
- **Technology Readiness Level (TRL):** At this stage, Serious Gaming solutions are generally at TRL 5–7: validated in relevant environments, ready to support learning, informed discussion, and collaborative decision-making, and adaptable for different contexts and stakeholder groups.
- **Example from practice:** In the **A-AAGORA project**, co-development activities continue in the Living Labs of Cork, Aveiro, and Tromsø. Digital prototypes have been tested and refined through participatory workshops (**Mini-Game TRL 8, Serious Game TRL 7**), incorporating iterative feedback to improve game design, scenario realism, and stakeholder engagement.

What do you need to have in place:

Implementing a Serious Gaming approach requires a combination of **organizational, technical, and social ingredients** to ensure that the process is effective, engaging, and relevant. The following key elements provide a foundation for planning and running Serious Gaming activities:

1. Participatory Framework and Stakeholder Engagement

- Collaborative setting: Establish a Living Lab or similar participatory environment where stakeholders can continuously engage, co-create, test, and play the game in a structured manner.
- Stakeholder commitment: Ensure active participation from a diverse mix of actors, including community members, policymakers, scientists, industry representatives, and other relevant stakeholders.
- Clear roles and communication: Define roles, responsibilities, and communication channels to facilitate inclusive, respectful, and constructive engagement.
- Engagement planning: Prepare strategies for recruiting, motivating, and retaining participants throughout multiple sessions.

2. Scientific and Contextual Knowledge

- Relevant data: Gather reliable ecological, social, and economic data that inform the scenarios and decisions within the game.
- Policy and governance context: Understand local policies, governance structures, and management objectives so that game scenarios reflect realistic constraints and opportunities.
- Stakeholder perspectives: Capture the interests, knowledge, and cultural values of participants to make the games locally meaningful, credible, and motivating.
- Integration of knowledge: Translate complex scientific and policy information into accessible, understandable content for game design.

3. Game Design and Technical Expertise

- Design skills: Develop or adapt game mechanics, narratives, and interactive scenarios to reflect real-world challenges and policy trade-offs.
- Prototyping capacity: Be able to create paper-based, board, or digital prototypes depending on available resources, technical infrastructure, and participant preferences.
- Outcome linkage: Build mechanisms in the game that link decisions to measurable outcomes, indicators, or feedback systems, so participants can see the consequences of their choices.
- Flexibility in design: Ensure the game can accommodate diverse participant types, learning objectives, and policy questions.

4. Facilitation and Evaluation Tools

- Structured facilitation: Plan and apply methods to guide gameplay, manage interactions, and support reflective discussions.
- Feedback and learning capture: Use surveys, questionnaires, observation, or discussion tools to evaluate participant learning, engagement, and satisfaction.
- Iteration and adaptation: Collect insights from each session to refine scenarios, mechanics, and narratives for future iterations.
- Translation to real-world action: Design pathways for game insights to feed into policy discussions, planning decisions, and community initiatives.

5. Iterative Development and Flexibility

- Testing and refinement: Be prepared to test, refine, and adapt games repeatedly based on participant feedback, scientific updates, and policy developments.
- Integration of lessons learned: Incorporate findings from early prototypes into subsequent iterations, improving relevance, usability, and engagement over time.
- Adaptability: Ensure the game can be scaled or modified for different contexts, participant groups, or socio-ecological challenges.

Key components of implementation:

Implementing Serious Gaming effectively requires a structured process that guides stakeholders from defining objectives to refining the game through iteration. The following steps outline a practical, hands-on approach, highlighting **what to do, how to implement it, and how to monitor progress** at each stage. This approach ensures that games are relevant, scientifically grounded, socially meaningful, and policy-informed, while supporting learning, collaboration, and decision-making.

By following these steps, users can systematically design, facilitate, and improve Serious Gaming activities, ensuring that each session contributes to both immediate learning and long-term co-development of solutions for complex socio-ecological challenges.

Step 1: Define Objectives and Context.

Clarify the purpose of the game (learning, decision support, stakeholder engagement, policy exploration) and the socio-ecological system or challenge it addresses. Gather relevant environmental, policy, and social information to shape realistic scenarios. Conduct preliminary research and stakeholder interviews, map policies and management objectives, and document ecosystem dynamics, human activities, and socio-economic factors. Ensure objectives are specific, measurable, and aligned with stakeholder needs, and that context information is complete and current.

Step 2: Identify and Engage Stakeholders.

Identify participants across communities, policy, science, and industry domains, defining roles and participation commitments. Use a stakeholder map to visualize relationships and influence, send invitations explaining expectations, and establish communication channels. Monitor recruitment and engagement, ensuring diverse perspectives and clear understanding of roles.

Step 3: Design Game Mechanics and Scenarios.

Develop interactive scenarios reflecting ecosystem dynamics, policy constraints, and management options. Define rules, roles, decision points, and feedback mechanisms, integrating environmental, social, and business components. Validate scenarios through co-design workshops, build prototypes (paper, board, or digital), and simulate gameplay. Ensure scenarios are realistic, engaging, and relevant.

Step 4: Facilitate Gameplay and Reflection.

Run structured game sessions, encouraging collaboration, discussion, and negotiation. Facilitate debriefings to reflect on outcomes and lessons. Prepare guides, visual aids, scoring systems, and feedback loops, documenting key decisions, conflicts, and insights. Track participant engagement and assess whether learning objectives are met through observation and short evaluations.

Step 5: Evaluate and Iterate.

Collect participant and facilitator feedback, analysing learning outcomes, engagement, and policy-relevant insights. Use surveys, interviews, or group reflections, compare outcomes with objectives, and refine game mechanics, scenarios, and facilitation methods for future iterations. Monitor changes in knowledge, attitudes, and collaboration to ensure continuous improvement.

Monitoring your success

To ensure that your Serious Gaming activities are effective and deliver the intended benefits, it is important to **monitor both the process and outcomes**. Monitoring helps you understand whether objectives are being met, identify areas for improvement, and provide evidence to support learning, decision-making, and policy dialogue.

1. What to Monitor. Monitoring focuses on five dimensions: (i) **engagement and participation**, assessing whether relevant and diverse stakeholders are involved and actively contributing; (ii) **learning and knowledge transfer**, examining gains in understanding of ecosystem processes, policy constraints, and management trade-offs, as well as cross-sector knowledge exchange; (iii) **decision-making and scenario outcomes**, evaluating how effectively participants explore trade-offs and whether outcomes reflect real-world constraints; (iv) **social and collaborative effects**, including trust-building, communication, and identification of shared solutions; and (v) **iterative development**, ensuring that insights from gameplay are captured and used to refine future game iterations.

2. Potential Ways to Monitor. Monitoring is conducted through a combination of methods. Facilitators use structured observation to document participation, collaboration, conflicts, and key decisions during gameplay. Short pre- and post-session surveys assess learning outcomes, attitudes, and perceived relevance. Structured debrief and reflection sessions capture insights on decisions, trade-offs, and lessons learned. Game-related metrics (e.g. decisions, scores, scenario outcomes) are tracked and compared across sessions to assess learning progression and realism. All feedback and adaptations are documented to support iterative improvement and reporting.

By monitoring these aspects systematically, facilitators can ensure that Serious Gaming remains **engaging, scientifically accurate, socially relevant, and policy-informed**, while continuously improving through iterative learning cycles.

Evaluation includes:

- Learning outcomes (pre/post questionnaires)
- Engagement metrics (participation, collaboration)
- Behavioural indicators (awareness and attitude shifts)
- Process feedback from facilitators
- Long-term policy and restoration impact

Where could also be applied to?

Serious Gaming can be applied in any socio-ecological system facing complex environmental governance challenges where multi-stakeholder collaboration is needed. It is a scalable, co-developed tool adaptable to different ecological, social, and policy contexts.

Area characteristics

Intention for applying this solution

Urban coastal zones balancing development and conservation

In dynamic urban coastal areas, the intention of Serious Gaming is to foster **collective negotiation between development pressures and ecological protection**. Games are used as safe spaces to explore policy trade-offs, infrastructure impacts, and restoration opportunities without real-world risk.

Through the Living Lab co-development process, stakeholders—such as urban planners, developers, conservationists, and citizens—jointly simulate scenarios balancing economic growth with biodiversity preservation. The goal is to **enable evidence-based, inclusive decision-making** that reconciles urban development with marine ecosystem health

with strong human–nature interactions

For estuarine and lagoon environments, where livelihoods and ecosystems are tightly interlinked, the intention is to **visualize and manage the feedback loops between human activities and ecosystem dynamics**. Serious Gaming allows communities to test the consequences of actions such as dredging, aquaculture expansion, or pollution mitigation, using scientifically informed feedback systems.

By embedding local observations and cultural narratives through the Living Lab framework, the game becomes a platform for **co-developing locally grounded, adaptive restoration strategies** that sustain both people and nature.



Small island communities pursuing climate adaptation

In small island contexts, the intention is to use Serious Gaming as a **collective foresight and capacity-building tool** to prepare for climate-driven challenges such as sea-level rise, coastal erosion, and resource scarcity. Games enable island residents, local authorities, and scientists to simulate adaptation measures—such as shoreline restoration, renewable energy adoption, or managed retreat—and evaluate their social, ecological, and economic implications.

The Living Lab process ensures that game design and outcomes are **co-created with community values and traditional practices**, fostering ownership and long-term resilience.

Arctic and remote regions integrating indigenous knowledge

In Arctic and remote coastal regions, Serious Gaming serves as a **bridge between scientific and indigenous knowledge systems**. The intention is to respect, represent, and integrate indigenous worldviews, seasonal knowledge, and stewardship practices into coastal management scenarios.

Through Living Lab co-development, games are designed collaboratively with local and indigenous communities to model the impacts of climate change, fisheries regulation, and habitat restoration in culturally appropriate ways.

This approach reinforces **knowledge sovereignty, intercultural dialogue, and collaborative governance**, supporting inclusive pathways toward Arctic coastal resilience.





Key Contact who to talk to about your application idea

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Work Package 2:

*Socio-ecological innovation
for deliberative democracy.*

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Further information (reading/resources box)

- Natures Edge Game <https://coastal-resilience-quest.nmsp.io/>
- Game developed in A-AAGORA <https://aaappetizer.a-aagora.eu/>

Selected literature

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Blueprint

Co-developed gamification

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