

Serious Games for Promoting Local Resilience

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1. Introduction: basic concepts

The aim of this research note is to explore how serious games can be tailored to diverse societal groups, evaluate their impact, and integrate them into resilience-building strategies. In an era of escalating global crises (natural disasters, pandemics, political instability) local resilience is critical. Communities must develop adaptive, anticipatory, and cooperative capacities to respond to systemic shocks.

Serious games, which can be defined as games designed for purposes beyond entertainment, represent promising tools for simulating complex crisis scenarios. They engage users both emotionally and cognitively, while fostering collaboration, critical thinking, and adaptive learning. According to Duchek (2020), resilience can be understood as a meta-capacity composed of three interrelated capacities: anticipation, coping, and adaptation. Anticipation involves identifying potential risks and weak signals; coping refers to managing crises in real time; and adaptation means learning from experiences to strengthen future resilience.

Strengthening local resilience requires the active engagement of diverse societal groups, each with specific roles, capacities, and learning needs. While competencies such as risk awareness, adaptability, and cooperation are broadly essential, their practical relevance and form of expression differ across target audiences. Effectively managing known risks while preparing for unforeseen disruptions is a complex challenge, particularly given the unpredictable nature of crises and their consequences (Iturriza et al 2017). Therefore, tailored educational strategies are needed to address the distinct requirements of each group and enable them to participate meaningfully in adaptive and transformative processes.

2. Societal groups as targets

There are different societal groups with different learning needs in order to increase community resilience. Three of them are of particular importance: i) civil society, ii) students and young professionals and iii) local decision-makers.

Civil society members, though directly exposed to disruptions like natural hazards and emergencies, often lack practical preparedness and confidence—highlighting the need for accessible risk awareness and survival skills, including mutual aid and emergency resource management. Strengthening these competencies shifts individuals from passive reliance to active engagement, fostering an internal locus of control, a mindset linked to greater resilience and problem-focused coping during crises.

Resilience education for young professionals and students must extend beyond foundational knowledge, equipping future leaders with cognitive, ethical, and social competencies to navigate complex, uncertain crises. Higher education should prioritize systemic awareness, scenario-based thinking, and interdisciplinary collaboration, fostering skills like understanding interdependencies, anticipatory decision-making, and critical reflection on societal norms. This group's openness to complex and dystopian scenarios creates opportunities for transformative learning, addressing emotional resilience, value conflicts, and long-term risks through immersive, game-based experiences. Serious games can deepen their sense of agency and responsibility, shifting their locus of control to proactive problem-solving and adaptive leadership in

crises. Ultimately, this education aims to prepare them not just to adapt, but to drive systemic change in institutions, communities, and policy-making.

Local decision-makers need leadership under uncertainty, strategic coordination, and mastery of emergency procedures, yet traditional governance often lacks the flexibility and adaptability required for transformative resilience. To build capacity, they must proactively anticipate crises—identifying risks, interpreting early warnings and make timely, adaptive decisions while mobilizing cross-sectoral networks and maintaining transparent public communication.

3. Serious games as innovative tools

In the context of resilience and disaster preparedness, serious games serve as effective instruments for simulating complex systems and facilitating experiential, risk-free learning within controlled environments (Marome 2021; Szatkowska et al. 2022). Defined as rule-based, interactive environments, they go beyond entertainment, focusing on education, awareness, and policy exploration through experiential learning and feedback (Szatkowska & Wasdaszko 2022).

Players engage in interactive storytelling and simulations, fostering critical thinking, perspective-taking, and role reconsideration in dynamic scenarios (Marome 2021). Their core goal is to enhance learning by leveraging the engaging, fun aspects of games (Schrader 2023). Serious games transform abstract and future-oriented concepts into emotionally engaging and cognitively challenging experiences, significantly enhancing motivation, retention, and knowledge transfer. Their educational impact is best understood through motivational, affective, cognitive, and sociocultural lenses (Schrader 2023). From a motivational perspective, serious games excel at sustaining learner engagement by leveraging interactivity and competition, which boost intrinsic motivation, interest, and persistence. The affective dimension further amplifies learning, as games evoke emotions like excitement and satisfaction—central to the learning process—through active participation and balanced challenges.

The **sociocultural perspective** highlights how serious games facilitate knowledge construction through direct experiences of success and failure, as well as collaborative interactions, aligning with social learning theories. Cognitively, these games enhance information processing by motivating learners to select, organize, and integrate new knowledge with existing frameworks. By embedding complex problem-solving in simulated environments, serious games encourage learners to make decisions, assess outcomes, and adapt strategies—skills particularly valuable for **resilience**, where navigating uncertainty and anticipating consequences are critical. Additionally, they foster **anticipatory thinking and futures literacy**, enabling learners to explore plausible futures and experiment with decisions in safe, realistic scenarios. While serious games hold substantial potential, their effectiveness is not automatic and often hinges on clear design goals; without them, learning objectives may go unmet (Erhel and Jamet, 2013). According to Iturezza et al. (2017), success depends on aligning game mechanics with educational purposes and audience needs, ensuring the game functions as a realistic training tool for high-stakes resilience scenarios.

Game mechanics and aesthetics also significantly impact outcomes. Collaborative competition, where teams tackle system challenges together, outperforms solitary play in learning effectiveness (Schrader 2022). Additionally, narrative depth, relatable characters, warm visuals, and music enhance emotional and cognitive engagement, deepening immersion and motivation. Finally, coherent feedback mechanisms are essential, allowing players to see the consequences of their actions and learn iteratively.

4. Types of serious games

Serious games encompass diverse formats, each offering unique strengths for resilience and disaster preparedness education. **Board games** excel in fostering **social interaction, negotiation, and collaborative problem-solving**, making them ideal for promoting teamwork and understanding urban interdependencies. According to Szatkowska (2022), these games allow participants to adopt stakeholder roles, experiment with risk reduction strategies, and reflect on systemic dynamics. Their **tactile, accessible design** (often featuring cards, tokens, and evolving challenges) encourages discussion, collective learning, and shared responsibility. Many draw inspiration from popular games like *Terraforming Mars* or *Pandemic*, emphasizing collective action under pressure. A notable example is *Résilience – le jeu sérieux* by the Département de la Gironde, where players act as "Special Agents of Resilience" to prevent territorial collapse through cooperative decision-making.

Digital and mobile games prioritize **immersion, real-time decision-making, and dynamic feedback**, enhancing emotional and cognitive engagement. These formats are particularly effective for developing **situational awareness and adaptive reasoning**. For instance, *Inside the Haiti Earthquake* immerses players in post-disaster scenarios, using real footage to highlight ethical dilemmas and crisis complexities. Similarly, *Stop Disasters!* and *Disaster Mind* simulate disaster planning and rapid decision-making, reinforcing proactive resilience strategies through interactive challenges.

Simulations and professional training focus on **cognitive flexibility and self-reflection**, providing realistic environments to rehearse critical events like emergency responses. Szatkowska (2022) and Bobillier Chaumon et al. (2018) emphasize their role in creating safe, interactive spaces for testing decisions and confronting trade-offs.

5. Conclusion: advocating for the development of a modular serious-games toolkit

While serious games are increasingly used for resilience-building, **a unified, evidence-based framework for their development, customization, and evaluation** remains absent. Building local resilience requires coordinated action from diverse actors with distinct responsibilities, knowledge, and readiness levels. To address their unique needs, a modular serious game toolkit is proposed, offering tailored formats aligned with specific learning objectives and challenges. Such a toolkit should be customizable, interoperable, and scalable, adaptable to varied socio-cultural, infrastructural, and geographic contexts. Its development should follow a participatory process, involving stakeholders in co-creation. Key steps should include:

- Refining learning objectives into actionable game scenarios.
- Integrating real-world data and narratives to boost immersion and relevance.
- Pilot testing across diverse groups to assess usability and engagement.
- Aligning pedagogical goals with clear learning outcomes and evaluation criteria.
- Creating facilitation guides to support educators and institutions.

Embedding participatory principles ensures serious games are theoretically sound, contextually relevant, and user-centered, enhancing their contribution to local resilience. When well designed, they foster learning, engagement, and behavioral change by enabling users to explore crises and uncertainties. Their success hinges on **aligning pedagogical goals, game mechanics, and user expectations**.

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