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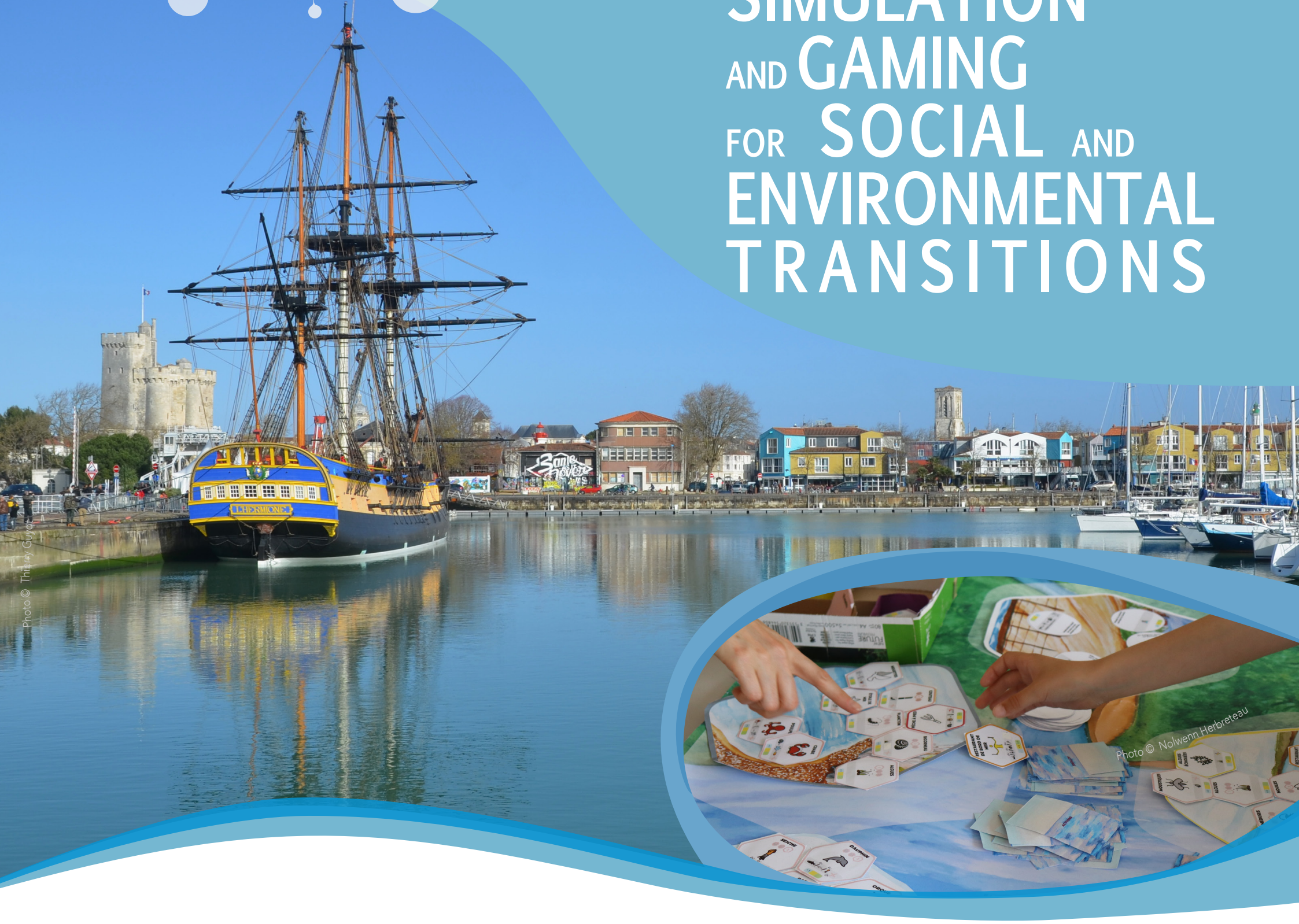

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«Dukunú Môlé, zogô cúnxença»: a serious game to reconcile biodiversity conservation and economic development in isolated tropical islands. The case of São Tomé and Principe

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Abstract. The republic of São Tomé and Principe (STP), a small island developing state (SIDS) is at a crossroads. The island faces major environmental and economic challenges posing threats to its unique biodiversity and primary forests. The island's fast-growing population, combined with poor environmental governance, has led to huge pressure on natural resources. Demand for timber, charcoal and firewood for cooking and overexploitation of non-timber forest products are leading to forest loss and fragmentation and habitat degradation of endemic species. A consortium led by an environmental NGO started a participatory process using a serious game approach to explore alternative land use trajectories and reconcile economic opportunities with conservation measures. The tabletop role-playing game was co-designed, co-constructed, tested and implemented over one year (dec 2021 – jan 2023). Nine game sessions were played, gathering a total of 130 participants from various economic sectors (e.g. agriculture, tourism, forestry) and background (e.g. students, farmers, policymakers). Despite its apparent simplicity and compact layout, the game successfully allows for the exploration of diverse trajectories and pathways within a limited time of 3 hours. It fostered exchanges on alternative scenarios, policy implications, and highlighted a general lack of understanding on environmental rules and regulations and on interdependencies and feedback loop in the system.

Keywords: São Tomé and Principe, Companion Modelling, Biodiversity, Livelihood Strategies, Landscape Approach

1 Introduction

São Tomé and Principe (STP) is an African small island developing state (SIDS) with lower-middle-income. At a crossroads, this hidden gem faces many sustainable development challenges: resource erosion, dependence on foreign aids and trade, growing population, lack of infrastructures and energy sovereignty, poverty and unemployment, weak land planning governance, etc [1]. As a biodiversity hotspot [2], STP promotes itself as a paradise archipelago and has committed to preserve its natural heritage. In 2006, two national protected areas were officially designated, covering more than two thirds of the territory if considering their buffer zones [3]. However, the boundaries, laws, regulations and rules in the buffer zones were never clearly defined and seem to fail in minimizing human impacts [2]. Moreover, since 1970 the fast-growing population, combined with poor environmental governance, has led to huge pressure on natural resources and threats for biodiversity [4]. Demand for wood for construction, charcoal for cooking and overexploitation of non-timber forest products (NTFP) leads to forest loss and fragmentation and habitat degradation of endemic species.

This abstract presents a one-year consultancy work (dec 2020 - jan 2023) between a conservation NGO (BirdLife International), a start-up specialized in serious games (LEAF) and two academic partners (ETH, CIRAD). BirdLife requested the development of a serious game to: (i) raise

awareness on the pressing environmental challenges, (ii) explore alternative development pathways for landuse management, (iii) identify barriers and levers to reconcile economic growth and biodiversity conservation. This paper presents the game development process and the first results of 9 playthroughs. The paper also reflects on the challenges, pitfalls, and successes of transferring knowledge and capacity on serious games from academia to a novice NGO.

2 Materials and Methods

2.1 A complex demand, a useful tool

The objectives of the game, as defined by BirdLife, were to: (1) understand stakeholders views on the spatial planning in the island, (ii) develop scenarios that model various land use, biodiversity and ecosystem functioning trajectories that can be used to identify landscape positive investment solutions for biodiversity conservation pilot activities, and (iii) produce recommendations to inform the formulation and implementation of land use policies. Additionally, the broad range of needs from the local partners and the local context in the island translated into methodological challenging criteria. The game ought to be: (i) simple enough to be played with communities with various levels of formal education, (ii) precise and realistic enough to be played with the highest levels of decision-makers, (iii) tailored for the specific case of São Tomé but generic enough to fit the contrasted reality of other small tropical islands, (iv) short enough to be unrolled in 2 hours, (v) long enough to unveil very diverse long-term landscape trajectories. In short, they asked for a model that would work as a viable metaphor [6] for the social and environmental problems it is designed to tackle.

To reconcile these apparent contradictions, we advocated for an intermediary level of stylized but empirical model [7] whose foremost objective was to foster social learning. We implemented a Companion Modelling approach [7] structured around 4 field missions (30 days in total): (1) scoping mission to identify burning issues and co-develop the conceptual model; (2) training on the serious game approach and game development; (3) testing the game and (4) playing the game with broader and mixed audiences.

2.2 Game description

The tabletop role-playing game revolves around a 26-tile board representing an imaginary island with 4 land covers: primary forests, degraded forests, agricultural areas, urban areas. Its name "Dukunú Môlé" was collectively selected through a participatory process. It literally means: "if we overexploit, we die". Players embody the role of community heads in charge of 3 families (representing labour forces/working capacity). The game starts in 1980 and runs for 5 rounds, each round representing one decade. Players' imposed objectives are to provide food and wood/charcoal for their family members. They can also decide, on a voluntary basis, to pay for the health and education of their family members. Food can be produced in agricultural areas or directly sourced from the forest through hunting or collecting NTFP. Wood/charcoal can be obtained from the primary or degraded forest areas for personal uses or can be sold for commercial uses. Cocoa/coffee can be grown as cash crops and sold at the market.

The game encompasses most of the on-going economic and environmental drivers of change: demographic growth (more families per round), urban expansion (opportunities for well-paid jobs in the urban areas), forest protection (through the creation of a protected area on round 3), new livelihood opportunities through ecotourism, among others. As an add-on to the haptic version, we created an agent-based model that incorporates all the game dynamics. It was initially used to record players' decisions to replay and revisit the game session during the debriefing.

2.3 Game sessions

Between July 2021 and January 2022, 9 sessions were organized, involving a total of around 130 people, including cocoa and coffee producers, college and university students, members of

parliament, ministry representatives and NGO & Civil Society Organisations representatives. Sessions lasted around 3 hours, with introduction (5'), briefing (10'), 5 rounds (2h) and debriefing (45').

3 Results

Despite the game's apparent simplicity, small-size layout, and limited roles and decisions, a large spectrum of landscape trajectories emerged across the 9 game sessions. The game allowed us to explore contrasted livelihood strategies (self-sufficiency for food vs cash crop) and human capital priorities (health and education). Players revealed diverse strategies with regards to forest conservation and timber extraction, as well as attraction for alternative job opportunities (eco-tourism, well-paid jobs in cities). While being played for only 5 rounds, the game highlighted the effects of short-term, purely capital-accumulation based strategies and their consequences on the overall depletion of the island (reduction of forests and biodiversity, decrease in hunting and gathering, erosion and dry soil, loss of eco-tourism, decrease in community income). The debriefings systematically confirmed a general lack of understanding on the buffer zone rules and regulations, poor knowledge on threatened species and limited overview on the interdependencies in the system. The game is also generic enough to support dialogue in other small island states facing similar drivers of change. The game also helped reflect on key factors to successfully transfer an academic approach to a novice NGO: trust building, experiential learning, adaptability, clarifying expectations and deliverables, overcoming semantic barriers to communication. In a context where participatory approaches are much wanted, this experience could serve as a stepping stone for developing a practical guide to transfer the ComMod approach from the academic realm to NGO and private organizations.

References

1. de Lima, Ricardo, F., Deffontaines, J.–B., Madruga, L., Matilde, E., Nuno, A., Vieira, S., 2022. Biodiversity Conservation in the Gulf of Guinea Oceanic Islands: Recent Progress, Ongoing Challenges, and Future Directions. In: Biodiversity of the Gulf of Guinea Oceanic Islands: 643–670 (L. M. P. Ceríaco, R. F. de Lima, M. B. R. C. Melo, Eds.). Springer International Publishing, Cham, Switzerland.
2. Ward-Francis, A., de Lima, R. F., Sampaio, H., & Buchanan, G. (2017). Reducing the extinction risk of the three Critically Endangered birds of São Tomé Final Project Report São Tomé Obo Natural Park. 1–92.
3. Sampaio, H. A. L., De Lima, R. ., Da Fonseca, R., Cabinda, G. ., Oquingo, G., Ward-Francis, A., & Havery, S. . (2015). Hunters and the Critically Endangered Dwarf Olive Ibis Bostrychia bocagei , endemic to São Tomé Island.
4. BirdLife International. (2021). Strategic Plan for São Tomé & Príncipe. January.
5. C.A. Garcia, S. Savilaakso, R.W. Verburg, V. Gutierrez, S.J. Wilson, C.B. Krug, M. Sassen, B.E. Robinson, H. Moersberger, B. Naimi, J.M. Rhemtulla, H. Dessard, V. Gond, C. Vermeulen, F. Trolliet, J. Oszwald, F. Quétier, S.A. Pietsch, J.-F. Bastin, A. Dray, M.B. Araújo, J. Ghazoul, P.O. Waeber (2020). The global forest transition as a human affair. One Earth 2, 417–428. (doi:10. 1016/j.oneear.2020.05.002)
6. Cleland, D. (2017). Viable metaphors: the art of participatory modelling for communicating sustainability science. Knowl. Manag. Dev. J., 13 (1) (2017), pp. 39-55
7. Le Page, C., & Perrotton, A. (2017). KILT: A modelling approach based on participatory agent-based simulation of stylized socio-ecosystems to stimulate social learning with local stakeholders. G. Pereira Dimuro & L. Antunes (Eds.), Multi-Agent Based Simulation XVIII. International Workshop, MABS 2017, São Paulo, Brazil, May 8–12, 2017, Revised Selected Paper. Cham: Springer, pp. 156-169. [doi:10.1007/978-3-319-91587-6_11]
8. Étienne M. (2014). Ed., Companion Modelling. Dordrecht: Springer Netherlands, 2014. doi: 10.1007/978-94-017-8557-0. See also www.commod.org/en