No	Comments and Answers
1	This manuscript provides a very interesting review of the process used to develop “serious” games for social learning among stakeholders in two different socio-hydrological systems in Indonesia: a mountain slope leading to lowland paddies, and a peatland “dome”. The games were developed based on hydrological studies using the Drivers, Pressure, State, Impact, and Responses (DPSIR) framework as well as analysis of the actors and stakeholders as well as the Actors, Resources, Dynamics, and Interaction (ARDI) framework. The introduction provides a good explanation of how games can influence action around water. It is particularly interesting how the study use the credibility, salience, and legitimacy framework to evaluate the two games. Answer: Thank you very much for your comments
2	The abstract concludes that “We provide clear steps in designing and adapting the game to another area…”. This is the area where more is needed to deliver on this promise. As currently laid out, there is not enough information about what kind of hydrological or socio-economic study is needed to adapt such a game to new contexts. Was this based on quick assessment or multi-year study of the two areas described? Answer: Thank you for sharing your concern about this. The socio-hydrological studies as the basis for the game development were a combination of previous studies and rapid assessment during the game development process to obtain information that is not yet available. We will add list of minimum information requirement and approach for game adaptation in the section 2.1 study area: “In order to diagnose issues and develop the H_2Ours game, the minimum information required from a socio-hydrological study includes: hydrological study (boundaries of the hydrological system, hydrological problems and efforts that should be done to overcome the causes and impacts of the problems), land cover study (types, changes and profitability), socio-economic study (village conditions, socio-economic issues, alternative livelihood options, institutional conditions). The approach taken to obtain this information is grouped based on local ecological knowledge (LEK), public ecological knowledge (PEK) and modeler/scientist ecological knowledge (MEK). The method was described as ‘rapid hydrological appraisal’ and tested in a number of Southeast Asan countries, and is part of a ‘Negotiation-support’ toolkit for learning landscape’ (van Noordwijk et al., 2013; Jeanes et al., 2006). Reference: Jeanes, K., van Noordwijk, M., Joshi, L., Widayati, A., Farida, and Leimona, B.: Rapid Hydrological Appraisal in the Context of Environmental Service Rewards, World Agroforestry, Bogor, 56 pp., 2006. Leimona, B., Khasanah, N., Lusiana, B., and ...: A business case: co-investing for ecosystem service

provisions and local livelihoods in Rejoso watershed, 2018.

van Noordwijk, M., Lusiana, B., Leimona, B., Dewi, S., and Wulandari, D.: Negotiation-support toolkit for learning landscapes, edited by: van Noordwijk, M., Lusiana, B., Leimona, B., Dewi, S., and Wulandari, D., World Agroforestry Southeast Asia Regional Program, 2013.

What number of game simulations and what number of actual players are needed?

Answer:

We will add explanations in section 3.3 Game implementation to give an idea of the number of simulations and players: "In general, the simulation of H_2Ours game takes approximately two hours (excluding briefing and debriefing). For the Rejoso watershed version, the H_2Ours game consisted of 10 rounds with 6-12 players divided into 3 groups acting as local communities: upstream, midstream and downstream. The PHU Pawan-Kepulu version consisted of 8 rounds with 8-16 players divided into 4 groups, and players are asked to select their village name as first step of creating ownership. In both versions, an additional group of players consisting of 2-4 people can act as public stakeholders (government, companies, NGOs) and interact with the villages."

The other gap in the paper is a description of who played the game, and whether there were differences in how different types of players responded in the game, or in their interactions with each other. For example, were all the players men?

Answer:

We will elaborate Section 2.4 Game implementation line 198: "In this study, we executed ten game sessions consisted of five sessions at each study areas. The five game sessions consisted of a session with a multi-stakeholder forum…… and four sessions with farmer groups……While in each simulation in Pawan-Kepulu peatland, we invited 12-16 representatives of farmer group from four villages in that landscape. In the invitation, we let the group determine who would attend the simulation, provided that the group representatives were willing to hold discussions and exchange information with participants from other villages. During the game simulation, we asked……."

"For the four sessions with farmer groups we selected participants according to different criteria. For Rejoso watershed, we conducted two sessions with participants who had experience with a recent Payment for Ecosystem Services (PES) program (Leimona et al., 2018) and two sessions with participants from neighboring villages where the PES program was not active. Meanwhile, at PHU Pawan-Kepulu we conducted a game session with members of the village forest management unit, a session with members of an active farmer field school, and two sessions with people who are not members of village forest management unit and farmer field school. Follow-up manuscripts are planned that will provide further analysis of these contrasts in player background. (Tanika et al, in prep)"

	Reference: Leimona, B., Khasanah, N., Lusiana, B., and ...: A business case: co-investing for ecosystem service provisions and local livelihoods in Rejoso watershed, 2018. Did the players from upstream play differently than those from downstream areas, even if they were not playing the parts of their own area? Answer We will integrate in the discussion section 4.2 Game evaluation and lessons learned: "In this research, we invited people from upstream, midstream and downstream to play according to their location. We did not yet have the opportunity to conduct simulations with role-switching players, but this can be done and can provide further insights. Recommendations for further research that makes use of the H_2Ours game are to allow players to switch roles to see how responses and perceptions depend on such shifts."
3	Line 173 says "profit is total income minus total capital". But if income is on an annual or seasonal basis, shouldn't that be the annualized cost of the capital (e.g. if there is a major outlay for pumps)? Or should that be "minus total costs" (which is what it says in the next sentence). In economic terms, there is a difference. Answer: Thank you for your correction. We will revise Line 173: "profit is revenue minus all financial expenses (taxes, cost, incidental cost, etc.)".
4	Figure 4B X axis is labelled Amount of groundwater), but shouldn't that be amount of surface water, or runoff? Answer: Yes, it should be 'amount of Surface water (ml)'. Thank you for your correction. I revised Figure 4B
5	Figure 4C and D, what does it say that the actual choices by the participants were so much below the simulated income, and mostly lower groundwater and runoff? Answer: We will provide a clearer explanation about the comparison between solution space and simulation results in the results section 2.3.4 Game solution space analysis and in the discussion. "The presence of relationship values between humans and nature and humans and other humans (relational values) influences decision making regarding natural resource management (van Noordwijk et al., 2020). Therefore, the decisions made by players during the game are influenced by various factors (e.g. interactions between players, game settings, level of player ecological knowledge, etc.) (Rodela R and Speelman, E.N., 2023, manuscript in review), whereas

	random decision making is used to build solution space. For example, when the upstream and midstream groups decided to maintain and improve their economic conditions, they caused a reduction in groundwater supply and increase flooding for downstream area, which caused the downstream group to pay for the losses it experiences. Apart from that, during the simulation the facilitator also provided Payment for Ecosystem Services (PES) scenarios (Appendix A, Game Play number 9: repeat step 6 for the rest of the rounds with additional scenarios such as providing payment for ecosystem services). This scenario offers downstream groups to contribute a certain amount of money to maintain more trees in the upstream and midstream. Therefore, the downstream groups economically always spend more money either as a loss due to the environmental consequences (floods or water scarcity) or as a prevention effort by joining the PES program. Reference: Rodela, R and Speelman, E.N., 2023, Serious game in natural resource management: steps toward assessment of their contextualized impacts, Current Opinion in Environmental Sustainability (under review process) van Noordwijk, M., Speelman, E., Hofstede, G. J., Farida, A., Kimbowa, G., Geraud, G., Assogba, C., Best, L., and Tanika, L.: Sustainable Agroforestry Landscape Management :, Land, 9, 1–38, 2020.
6	Figure C1: how do the villages match the peat dome? Answer: Thank you for your question. Referring to Figure 2A (PHU Pawan-Kepulu), in reality the positions of peat domes are spread across several villages with different distribution. There are villages dominated by peat domes and buffering areas, and some of them are dominated by shallow peat. But, in the game board design, the distribution of peat depth (including peat domes) is distributed evenly in all villages. This is intended to facilitate replication for other locations. We will add further explanation regarding peat dome distribution across the village in Appendix C line 505: “The hydrological boundary of peatland in peatland hydrological unit (PHU) as an area between two rivers. Usually inside this landscape we can find a dome (the deepest peat area), area surrounding dome (buffering dome area) and shallow peat area. The peat depth are spread across villages with different distribution. However, to facilitate the replication of the game, we designed the distribution of peat depth (including peat domes) is distributed evenly in all villages. Figure C1 shows the conceptual game model of H2Ours game for peatland version. However, for further simulation, we can design a game board with different peat depth distributions for each village”
7	The paper needs a good copy editor throughout ,including the appendix. Answer: Thank you for pointing this out. We will scrutinize the next version to be submitted.