



**HAL**  
open science

# A serious game to foster deliberation, social learning and the sustainable transformation of territorial food systems

Pedro Lopez-Merino

► **To cite this version:**

Pedro Lopez-Merino. A serious game to foster deliberation, social learning and the sustainable transformation of territorial food systems. 54th Conference of the International Simulation and Gaming Association, ISAGA, Jul 2023, La Rochelle, France. pp.292-305. halshs-04237854

**HAL Id: halshs-04237854**

**<https://shs.hal.science/halshs-04237854>**

Submitted on 11 Oct 2023

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

# A serious game to foster deliberation, social learning and the sustainable transformation of territorial food systems.

Pedro Lopez-Merino<sup>1</sup>

1- Gredeg – Université Côte d'Azur. Bâtiment 2, Campus Azur du CNRS,  
250 rue Albert Einstein - CS 10269 - F 06905 SOPHIA ANTIPOLIS Cedex, France.

**Abstract.** The urgent transformation of food systems towards social and ecological sustainability requires a better consideration of the territorial scale and of social learning processes at play that allow actors to better grasp both the complexity and the impact they can have on the food system. For this, deliberation among local actors appears as a useful approach to gather a diversity of experiences and visions. This article presents a conceptual framework and a serious game that seeks to create such deliberation on the topic of how food-related practices have an impact on the territorial food system. Having put the game to test three times in the context of an action-research project, we present some elements of observation that show how deliberation and social learning take place during the activity, and discuss the implications it can have to support the said learning and transformations.

**Keywords:** Territorial Food Systems, Transformation, Deliberation, Social Learning

## 1 Introduction

The territorial scale is increasingly seen as the right one to promote sustainable and just food systems, both by scholars [1]–[3] and international organisations [4]. A territory is an evolving social construction not necessarily circumscribed to administrative lines. It is the place where practices, direct relationships, collective action, and a common cultural view rooted in a historic evolution exist [2], [5], [6]. It is also the scale at which transitions to sustainability can more easily and organically take place, and territorial approaches allow bringing together diverse actors and therefore contribute to the construction of shared visions of sustainability and justice. Given the cultural specificity of food, work aimed at changing practices towards a better incorporation of sustainability needs a better consideration of the local scale than what is currently done [7].

The sustainability of territorial food systems (TFS) requires more than just technical shifts, and asks for social innovation and systemic restructuring [8]. Thus, changes in actors' behaviours, values and relationships are just as central to territorial sustainability as can be technical improvements for less polluting forms of production, or more efficient ways of irrigation, packaging and recycling. **The notion of transformation, a radical and profound change at the individual and collective level spanning different scales [9], [10], thus appears as a necessary element if sustainability is to be achieved.**

The literature on participatory research often discusses the issue of collective and social learning, perceived as instrumental in fostering such transformations [11]. Deliberation is seen as a particularly useful way of fostering social learning in a participatory setting, namely in the area of sustainability assessment [12], [13]. Moreover, participatory and deliberatory methods for sustainability issues tend to have a better consideration of the territorial scale (often carried out at the level of a city or rural area), than do their top-down counterparts [14].

Although an important proportion of individuals currently agree on the need to change their food practices towards a better incorporation of environmental and social issues, namely with regards to consumption, the literature and day-to-day experience find that their actual change in behaviour is often limited [15]. Part of the explanation for this is that behaviour is dependent on

social norms [16], and so behavioural change needs to be anchored in social interaction and learning [17]. The evidence suggests that games are effective tools to support learning and change [18]–[20], and so they offer a promising potential to help tackling socially-dependent sustainability issues, including this intention-behaviour gap.

With all this in mind, we conceived a serious game with the concrete aim of creating an engaging space of argumentation and deliberation around the issue of how our food practices impact the territory we inhabit in its ecological, social and economic dimensions. The intention behind it is to foster social learning on this issue, with the ultimate goal of supporting change and the sustainable transformation of a TFS.

The article is structured as follows: Section 2 introduces elements from the literature on deliberation, social learning and transformation, in order to operationalise their definition around a common framework of the sustainability of TFS. Section 3 presents the game we conceived. Section 4 offers a number of observations gathered from its three implementations, in terms of the game's objectives (create a situation of deliberation, promote social learning, and support change and the transformation of the TFS). Finally, Section 5 discusses the implications of this for researchers and practitioners working on sustainability transitions of TFS.

## 2 Deliberation, social learning and transformation

Defined as an exchange of arguments through which individuals can change their views [21], [22], deliberation is deemed as a useful way to look for consensus, produce knowledge and orientate action. In a paradigm of post-normal science [23], the value of deliberation is not derived from its capacity to give definitive solutions to problems identified, but from the equal footing in argumentation that concerned participants have [24], [25], and the inclusion of diverging views and values that can help reaching a common understanding of the social and ecological causes of problems, and desirable pathways out of them [26]–[28]. Participation and deliberation are deemed as potentially having a strong transformative effect on TFSs [29], [30]. Contrary to other areas in which a sustainability transition is also needed (such as energy or transport), food is chiefly a cultural phenomenon, encompassing dimensions well beyond the satisfaction of specific nutritional needs. In this, creating spaces where individuals can safely exchange and explore common views on how to co-create a sustainable TFS is of utmost importance, and perhaps more urgent than in other areas.

Participatory deliberation is closely linked to the notion of social learning, which has progressively become a new paradigm in adaptation and sustainability [31], [32]. Deliberation and social learning are linked in that the former produces learning effects “that go beyond individual and predefined interests and/or values, and create opportunities for a shared understanding and joint action” [33].

Social learning is difficult to conceptualise, and the entirety of sources checked for the purposes of this article coincide that its definition remains a matter of debate—when not something researchers choose to avoid outright [19], [23], [24], [32]–[35]. In the context of participatory approaches to complex problems with multiple stakeholders, [36]<sup>1</sup> define social learning as “a convergent change in the stakeholders’ perspectives on the problem and its possible solutions and risks, as well as on their own and the other stakeholders’ position<sup>2</sup> and responsibility with regard to solving the problem”. This definition<sup>3</sup> is of interest when applied to TFSs, where a multiplicity of daily decisions on the part of actors impact their sustainability, therefore calling for an increased awareness of the interdependencies and uncertainties at play, as well as responsibility and ownership with regards to the issues at stake (“systems thinking” [33]).

<sup>1</sup> In their case, natural resource management.

<sup>2</sup> This can be related to the notion of *relational reflexivity*, studied by [37] in the context of value-based food chains.

<sup>3</sup> The definition is compliant with the conditions of [35]: change in the understanding of involved individuals that is situated in wider social units resulting from the exchange of ideas, arguments and information.

Another central concept in a sustainability transition at the territorial level is that of transformation. Policy and research arenas insist more than ever on the importance of societal transformations to tackle the sustainability challenges of the 21st century. Transformation has been defined in the ecological economics literature as a rupture producing a non-linear and lasting change towards more desirable socio-ecological systems [38]. It implies changing the rules, paradigms and values that underpin deep system properties [39], fundamentally changing the way we think about the complex systems that sustain us [33], [40], including our food system.

Based on a thorough review of social learning in ecological economics, [32] claim that transformative change is supported by the creation of new relationships and the strengthening of old ones. A transformation is thus also a reinforcement of the sense of community and of local embeddedness, something that implies a depart from the evolution of western secular societies over the past few centuries [27], [41]. In this, deliberation, social learning and transformation form part of what has been termed a “new Galilean Shift” [33], [42], where a change in the centre of attention from self to community and environment takes place, and where the primacy of scientific reductionism and calculation gives way to the coherence of narratives and interpretations.

To sum up:

Deliberation is

- an exchange of arguments
- giving participants equal footing in argumentation
- including diverging views and values

Social learning is

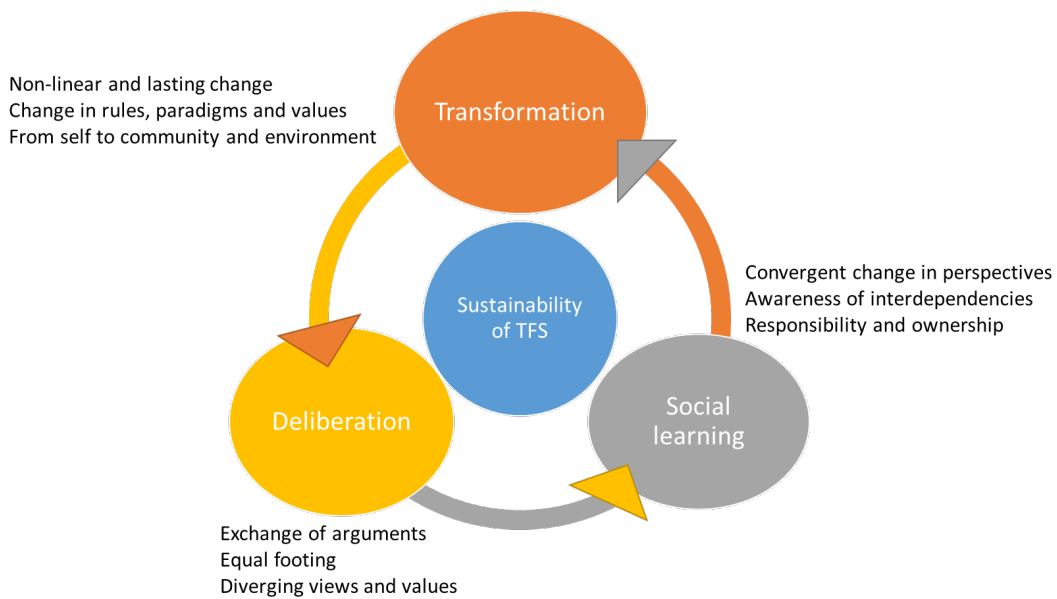
- a convergent change in perspectives
- bringing about an increased awareness of interdependencies
- creating a responsibility and ownership of issues at stake

A transformation is

- a non-linear and lasting change to a more desirable system
- implying a change in the rules, paradigms and values that underpin system properties
- producing a shift from self to community and environment

Transformations play out at the level of individuals, groups and place-based socio-ecological systems. The collective and localised aspect of these changes have not been given as much importance as their individual aspect, which is coherent with a larger global paradigm of efficiency [27]. Nonetheless, transformations cannot be achieved by individuals in isolation and purely based on a system of incentives. The link between participation, social learning and transformation needs to be given more prominence: as the said rules, paradigms and values are the output of a social construction, having them changed inevitably needs to involve a process of collective learning.

We articulate these three elements in a common framework with regards to the sustainability of TFS from a post-normal science point of view. Participatory deliberation helps producing social learning which, under certain conditions, can help foster transformations. Such transformations, by increasing collaboration and the consideration of the collective interest raise the use of deliberation as a tool for learning and decision-making. Using a ternary structure, we can argue that change for sustainability of TFS has these three elements as its determinants, each of them including the three specific aspects highlighted above.



**Fig. 1.** Deliberation, social learning and transformation as a framework for the sustainability of Territorial Food Systems from a point of view of post-normal science.

### 3 Using a serious game as a deliberative tool for transformative social learning

#### 3.1 Context and objectives of the game

It appears as useful to put to test tools and approaches that can have the elements of the above framework act together. Why using a game, though?

The importance of playing as a vector for learning has a long history in the field of developmental psychology [18], [43]. More recently, scholars working on sustainability issues have paid attention to the possibilities that playing offers in terms of social learning and transformative change [19], [44]. The literature refers to “serious games” as those whose primary purpose goes beyond entertainment, and where a rule-based, interactive environment, gives players the possibility of learning by taking actions, under the assumption that the learning that emerges can be transferred to and affects the world outside the game [44], [45].

Serious games can be useful tools for deliberation and learning on sustainability issues, as they can help dealing with situations that involve changing the mental models of actors [46], building trust and understanding the conflict dimension of a transition [19], [47].

The design of the game was done with a few objectives in mind, related to the elements exposed in the preceding section:

- O.0: The game is engaging and fun to play.*
- O.1: It recreates a situation of deliberation on the sustainability of the TFS.*
- O.2: It produces social learning.*
- O.3: It aims to contribute to a transformation of the TFS*

These objectives are, needless to say, increasingly ambitious. Objectives O.0 and O.1 were thought out from the conception stage of the game. O.2 contains more abstract notions that can, in the best of cases, be observed during the game and ex-post. O.3, the final objective, needs situating the game in a much larger context, to which we get in the discussion section.

We put the game to test twice in 2021 and once in 2022, all facilitated by the author of this paper. Each time we allowed for 45 minutes of play, which gave enough time for 7 rounds of argumentations and objections. On all occasions, we took an extra 15 minutes for instructions before playing. On the first and third occasions, we added 25 minutes to debrief at the end (we

only had 5 minutes to debrief the second time). The third debriefing was guided by a series of questions pertaining to the framework exposed in this article. Video recordings were made on all occasions after having participants agree to a GDPR-compliant charter, and a participating observer [49] joined each time.

Date	Venue	Number of participants	Mean age	Ratio Female	Field of activity
6 July 2021 (Group 1)	Plenary group, <i>l'Assiette et le Territoire</i> project <sup>1</sup>	13 players 1 Referee 1 timekeeper 1 observer	44.0	62.5%	Charity/NGO: 29.4% Farmers: 11.7% Local gvt: 47.1% Research: 11.7% Education: 0% Student: 0%
24 Sept 2021 (Group 2)	1 <sup>st</sup> Open Forum <i>local de l'alimentation</i>	11 players 1 Referee 1 timekeeper 1 observer	40 <sup>2</sup>	64.3%	Charity/NGO: 42.9% Farmers: 14.3% Local gvt: 28.6% Research: 0% Education: 14.3% Student: 0%
9 Dec 2022 (Group 3)	2 <sup>nd</sup> Open Forum <i>local de l'alimentation</i>	4 players 1 observer	31.4	50%	Charity/NGO: 20% Farmers: 0% Local gvt: 60% Research: 0% Education: 0% Student: 20%

**Table 1.** Data on each of the times the game has been played.

**Table 1** shows some descriptive elements for each of the times the game was played. Almost the entirety of players were adults with formal training (save for a teenage player on Group 3), with a predominance of women on Groups 1 and 2. In general, there was a predominance of actors from charities/NGO and from government agencies.

It is noteworthy that players were all voluntary participants to a project and forum dealing with food and territorial transitions, an aspect to which we get back later in the article. Group 1 participants were well-acquainted with one another, and had an expressed stake on the TFS, either as farmers, researchers, politicians, consumers, etc. Participants from groups 2 and 3 were for the most part unacquainted with one another. The role of each type of participant is explained in the following section.

### 3.2 Design of the game

Each team is composed of two or more players. Other than the players, there is a referee and a timekeeper, as well as the facilitator. The materials used in the game are:

- *Context cards.* 45 short phrases describing the characteristics of the TFS of southern Ardèche, based on participatory work carried out by the *l'Assiette et le territoire* project and partners. At each round, a team has to draw between 1 and 4 of these
- *Practice cards.* 35 different (non-exhaustive) possible actions regarding food, based either on an individual decision (e.g., which type of distribution to favour) or on

<sup>1</sup> <https://www.assiette-territoire.com/>. For more information on the inspiration and outputs of the project, see [48] (in French).

<sup>2</sup> We do not have exact data for ages with this group. We provide an estimate based on those we know.

collective forms of organisation (e.g., to organise group purchasing schemes). At each round, a team starts with two of these and have to choose one to play.

- *Wild cards*. Specific instructions designed to earn points outside of the main rules of the game. In rounds where wild cards come out, no new context or practice cards are played.
- Dice, board, markers (green, red and black).

Teams earn points by drawing links between the chosen *practice* card and any number of the *context* cards already on the board. A green link (2 points) is drawn when a given practice has an impact on a context card that is deemed as good for the TFS. A red link (1 point<sup>3</sup>) implies, conversely, a negative impact on the TFS. A link must be argued for briefly for it to be counted. For example, the practice purchasing in a chain store may be deemed as having an impact on the element of context several short circuit sales initiatives, and the team could argue that it is a red/negative one because such a practice will reduce the incentive for farmers to sell directly, which is something they value in the territory.

Teams can also object to the links drawn by the other team. Objections can be either because they deem the link as non-existing, or because they think it is not of the colour selected. Using the previous example, they may say that buying in a chain store should have a green link with the presence of direct sales points because it is important to concentrate food distribution in order to avoid car miles, therefore contributing to a low-emissions territory. When an objection takes place, it is up to the referee to determine whether it trumps the previous argument or not. If the objection does trump the previous argument, the link's points go to the objecting team.

A given round of play happens as described in the flowchart in Figure 2.

---

<sup>3</sup> The choice of fewer points for negative links was done to promote a deliberation on practices positively affecting the TFS.

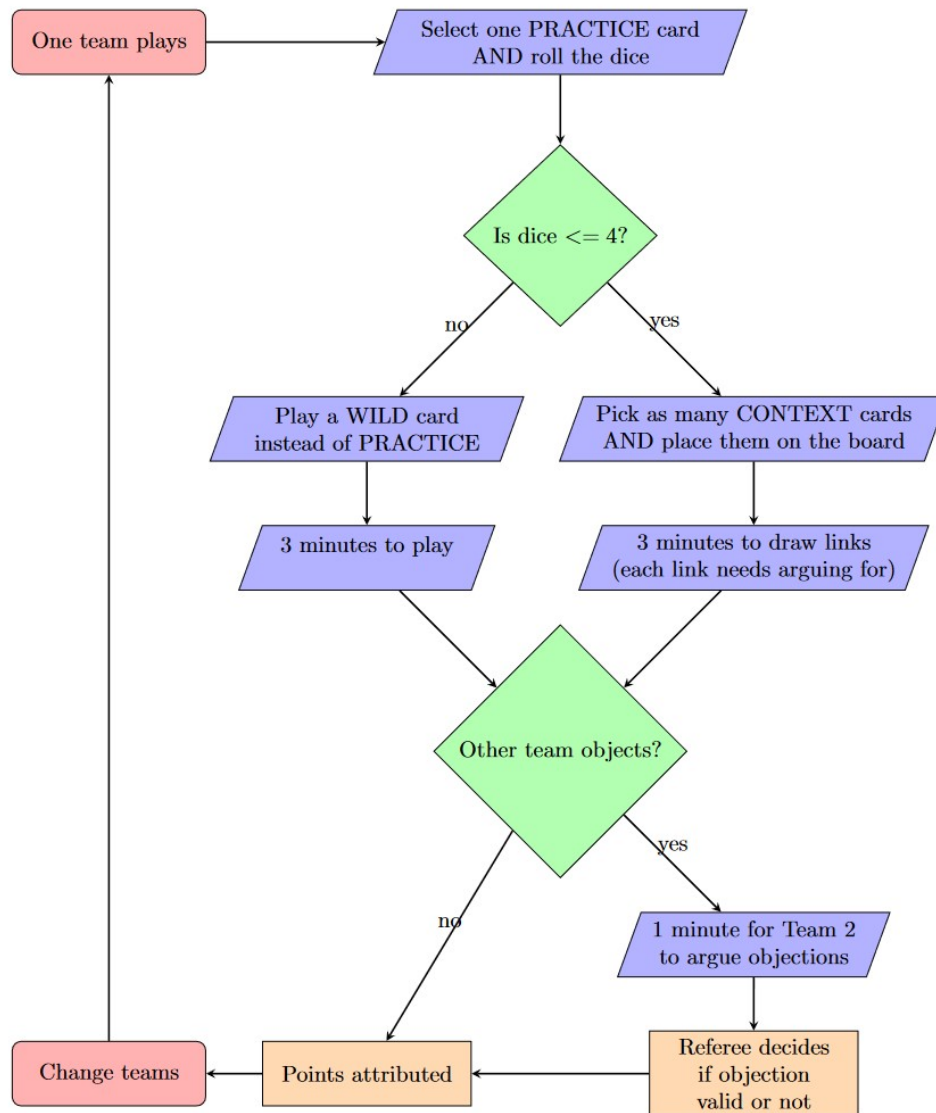


Fig. 2. Description of a round of play.

## 4 Elements of observation

Below, we classify some of the observations based on the framework presented in Section 2.

### 4.1 Engagement and fun (O.0)

The game turned out to be an entertaining and engaging activity for players. During both debriefings, participants were unanimous in saying that they enjoyed taking part in the activity, and both the on-site observation and the analysis of the videos show an atmosphere where the enjoyment and the pleasure of playing are present. Participants expressed appreciation for being given the opportunity to interact with others on issues pertaining to their TFS. Nonetheless, the appreciation was lesser in the third occasion, in which participants felt that teams were too reduced for allowing the emergence of a variety of views that could render arguments more solid.



## 4.2 Deliberation (O.1)

*Exchange of arguments.* Arguments were exchanged throughout the activity, both within teams and between them: within, when a team has to decide how to justify the links they are playing, between, when they bring arguments forward to play and eventually to have it confronted by an objection. Argumentation within groups was quick and leaning towards consensus, and so arguments were put forward relatively quickly and in a homogeneous fashion. Conversely, argumentation between teams proved more contentious and leaning towards divergence, and objections were placed on links at least once almost in every round.

*Equal footing.* We have reason to think that the game favours equal footing in argumentation, more than what can be achieved in a regular discussion on the same issues. Participants were remarkably active in discussions within and between teams, even those who initially mentioned a lack of knowledge or capacity to argue on the issues at stake (such as a young teenager who joined one of the activities). During debriefings, they showed appreciation for the space the game gives to exchange and express themselves. Conversely, we could observe that during instructions and debriefing, speech was less equitably distributed, with some individuals taking a more central role in the discussion—even creating a situation of tension whereby one participant had to ask “can you please let me finish my sentence” to another one, something that never happened during the actual game. The rules of the game favoured this equity, as each team is informed that they will have a time to counterargument *after* the three minutes of argumentation have elapsed, and since teams have an incentive to listen to everyone’s arguments so as to pick the most credible one.

*Divergent views and values.* Views expressed concerning the positive or negative impacts of practices played could differ, both within and between teams, and the professional interests of players had a visible role on this (an entrepreneur selling vegetable steaks and a farmer practicing extensive husbandry both gave counter arguments that implicitly defended their positions). The frequency of objections attests to the presence of divergence in *views*, although *values* appears as far more homogeneous (we saw no discussion playing out at that level, an issue we get back to in the discussion).

## 4.3 Social Learning (O.2)

*Convergent change in perspectives.* We could observe some convergence in perspectives during the activity, with players being confronted to an objection generally showing acceptance of the counterarguments presented. We witnessed a couple of moments where new insights were gained, such as when a person from a small village went against the idea that tourists were a favourable element for small shops and open air marketers, giving an argument based on an acquaintance’s personal experience with tourists—or when a vegetable steaks’ seller discussed the positive impact of a vegetarian diet on attenuating climate change “even when accounting for the negative effects of imported soya beans”. According to Group 3’s observer, the fact that teams are composed randomly was supportive of exchange and convergence, since it forced players to team up with people they may not have spontaneously chosen.

*Awareness of interdependencies.* By its very design, the game brings about an exploration of interdependencies between practices and elements of context, the final picture on the board being one of intertwined links (see figures 3 to 5 in Annex A). We could observe some capacity to explore and discuss impacts based on interdependencies that were not initially accounted for (such as a discussion on the interest of buying directly from farmers, deemed as very positive by one of the teams but objected as potentially having a negative impact on the local shops by the other one). Counterarguments were often based on an increased subtlety in exploring these impacts, and it was mentioned during the debriefing that the very fact of having cards with the different contextual elements brings about a propensity to explore the issue. At the same time, however, it was expressed also that the discussion remained within the boundaries of relatively known issues that are already common ground.

*Responsibility and ownership of issues at stake.* Regarding the possibility of the game increasing the players' responsibility and ownership of issues at stake, a discussion took place during the debriefing with Group 3 players, after asking the extent to which the game motivated them to act differently than they currently do. Responses to this question were elusive, giving reason to think that the game was at best mildly successful in increasing players' sense of responsibility and ownership of their TFS. At the same time, they showed some self-reflexivity by expressing that they were all acquainted with and sensible to the issues at stake, and that a better way to assess this item would be to play the game with people or in places less used to such reflexions.

## 5 Discussion: towards a transformation of a TFS

The observations presented above suggest that the game produces deliberation and, to some extent, social learning, therefore contributing to the transformation of the TFS through the dynamic framework presented in Section 2. Although transformation is the ultimate *design-in-the-large* [23], [50] objective of the activity, it would be excessively ambitious to claim that it can, by itself, produce a full-blown non-linear and lasting transformation just by having a handful of individuals playing and debriefing on it for 90 minutes. In this, its inclusion in a wider and longer lasting activity (the aforementioned action-research project) is central to any transformative potential it may have, inasmuch as the different outputs of the project—production of a common manifesto, better comprehension of the TFS's trajectory and levers for change, experimentations and organisation of local forums—all fit inside the framework described in Section 2. Nonetheless, this can render the game excessively context-dependent and with little external use if one is not able to devote considerable time and resources, and have enough human and financial support. A 'ready-to-use' version could be conceived so that its implementation is simpler on different contexts, although we have not worked on that as of yet—giving instead preference to its embeddedness.

This lack of external use notwithstanding, the activity gives reason to be hopeful with regards to the transformative shift from self to community and environment described above, as it appears that such a shift has to a large extent taken place at a cognitive level with the public chosen. As described in the observations, *value* divergence was virtually non-existent, and players could argue at ease with regards to the TFS sustainability from a social and environmental point of view. They all agreed to already having community and environmental issues as guiding principles in their daily actions—giving hope that a transformation may already be underway. Two points of caution need highlighting, however. First, our players are not necessarily representative of the territory, as such projects and forums bring together like-minded individuals sharing a common view against mainstream industrialised and globalised agriculture, with protection of nature and of local relations in the food system seen as key pillars. A different activity would certainly have taken place if more diverse players had joined, increasing the *divergence* component of deliberation. This would also be useful in terms of the game's impact and perceived legitimacy [24], [51], and potentially help bridging existing fractures between conventional and alternative networks that can work against territorial transformations [2]. One can also theorise that a higher diversity of views and knowledges can increase the *social learning* aspect of the activity, although until we do further testing this remains a hypothesis. Secondly, players expressed discouragement during debriefings as to the actual transformative potential of individual action, with stakes perceived as too large to be tackled without action at the higher levels and through public action. Indeed, the two times wild cards pertaining to collective or institutional action were played, the actions chosen were among the most impactful in terms of positive links created with the territory—despite being based on costly efforts such as purchasing land on a large scale to reorient the local production. The feeling is that individual and/or localised actions can have a relatively minor impact when compared to high-level policy ones.

Moreover, having relatively homogeneous players can reduce the exploration of the *conflict* element of sustainability, as not only players share views but also tend to be in similar socio-economic positions. The inclusion of more precarious publics, as well as of dominant actors from the production chain could have increased the level of disagreement, and perhaps give a more prominent role to the referee. We could see how players with a commercial stake (farmer, seller) were the among the few to bring actual new insight to the discussion, and so it would be an interesting thing to have more dominant players who positively benefit from the unsustainable state of the TFS [29]. On top of this, mainstream views and discourses on sustainability have tended to favour “win-win” views that hide the sacrifices and efforts that are needed in a transition [7], [52], [53]. Such narratives are present even in “alternative” groups such as the ones we played with, which we could amply observe during the rounds of argumentation, and is illustrated by the fact that practice cards tend to be associated to green-only or red-only links<sup>4</sup>. Learning how to deal with conflict-ridden situations has been identified as one of the key aspects of social learning for sustainability [33], and so a more direct inclusion of conflicting interests in terms of players could be a welcome addition, in a playing context that could foster conflict without real-life consequences [54].

The game also created a space for a meta-reflexion on the issue of how deliberation and social interaction can contribute to TFS sustainability, providing some support to the notion that social interaction is perceived as one of the forms of social innovation with the highest territorial impact. Towards the end of the activity with group 1, the card “participating in forums on the topic of food” came up. It quickly became the card with the most positive links on the board, with a total of seven (half of the context elements present on the board by then). Taking part in such forums was deemed as positively impacting the territory on counts ranging from the current lack of support for new farmers to the good availability of open-air markets in the territory. This is an interesting finding in terms of the game and its larger research context, which explores how social interaction can be a lever for change and transformation, instead of traditional monetary incentives or knowledge transfer that are more often discussed and promoted at higher levels.

The issue of knowledge transfer also deserves some discussion. The choice of not having a role of an expert in the game was a conscious one in order to favour the emergence of collective knowledge and reduce to a minimum any top-down or authoritative forms of argument. Nonetheless, players from Group 3 ended up calling for it, as they felt that the validation of certain key arguments became difficult or even impossible in the current setting. Further work should better tackle this issue, balancing the need for expertise and data, while being attentive to how it may affect the equally important need for equal footing in the deliberative setting.

Practically speaking, our three experiences give some lessons as to the number of participants needed for the game to work properly. The number of participants in Group 1 and Group 2 (10 and 9 players divided in two teams, respectively) seems to strike a right balance in terms of internal exchanges. Although we have not tested it, too many players would likely make it difficult for teams to sufficiently exchange before putting forward arguments in the limited time they are given. As mentioned above, we could see that having too few players (as in Group 3, where only 4 people played divided in two teams) also restricts the quality of arguments that are brought forward. We thus recommend playing the game with 4 to 5 players per team. Likewise, the absence of a referee was perceived as a drawback by Group 3, as consensus was often out of reach when objections were raised. This gives a potential avenue for exploration, as the role of a referee could be merged with the expertise and science discussed in the above paragraph.

The focus of the game is the environmental and social sustainability of the TFS. In this, it leaves out both individual interests (e.g. health) and planetary ones (e.g. carbon emissions), which can be at odds with one another and further create win-lose type situations and demand expert knowledge. Arguments on health and ecological issues did come up from time to time,

---

<sup>4</sup> Only 5 links out of a total of 72 created in all three occasions appear as having a different colour than the rest of the links in the same practice card. See figures in the Annex.

although such moments were marginal rather than the norm. Modifications to the game could be done if these issues need to be more directly tackled, although this would inevitably add to the complexity of an activity that is already perceived as difficult to grasp—thus requiring simplifications elsewhere in the rules.

## 6 Conclusion

The framework and game presented in this article explore whether deliberation can produce transformation through social learning. Observations suggest that deliberation does take place, and that elements from the definition of social learning are present. These can all be supportive of Territorial Food System transformations, as can be their belonging to a wider action-research project. Nonetheless, we identify a number of issues that limit the transformative potential, namely the inclusion of a wider variety of actors.

## Acknowledgements

This work was carried out as part of the author's PhD. It was prepared in two research labs: Lamsade (Université Paris-Dauphine, PSL) and Ecodéveloppement (INRAE, Avignon), under the supervision of Juliette Rouchier and Claire Lamine. The PhD was funded by the French Agency for Ecological Transition (ADEME), and the work presented in this article was supported by two projects: L'Assiette et le Territoire (aforementioned) and ATTER (Agroecological Transitions for Territorial Food Systems, with funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 101007755.)

## Appendix 1. Photos of the final boards of each of the groups.

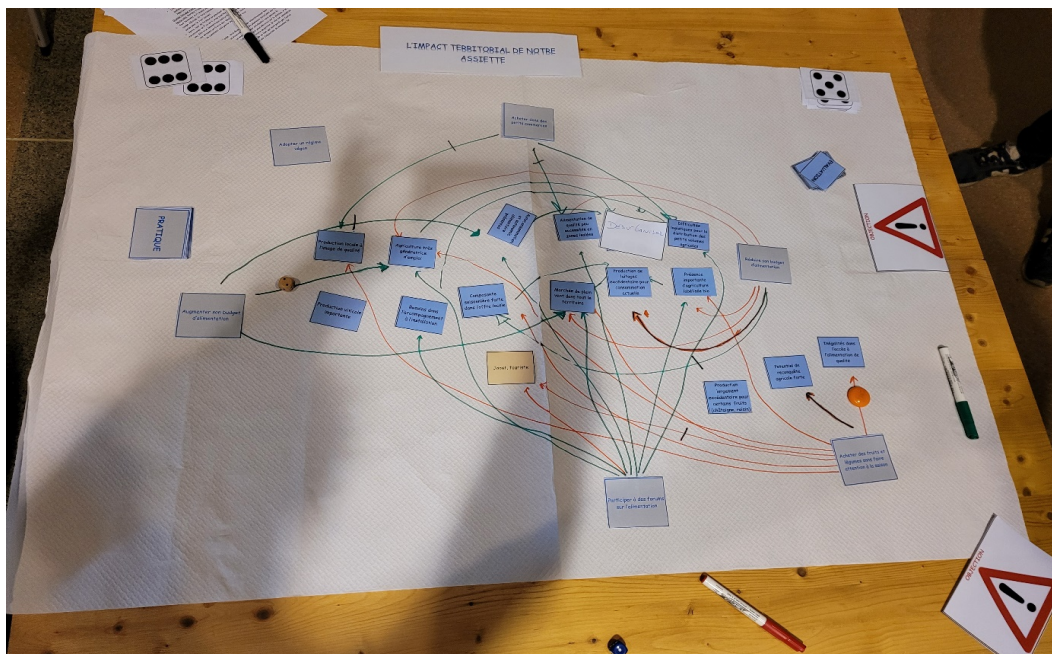


Fig. 3. Photo of the final board, Group 1.



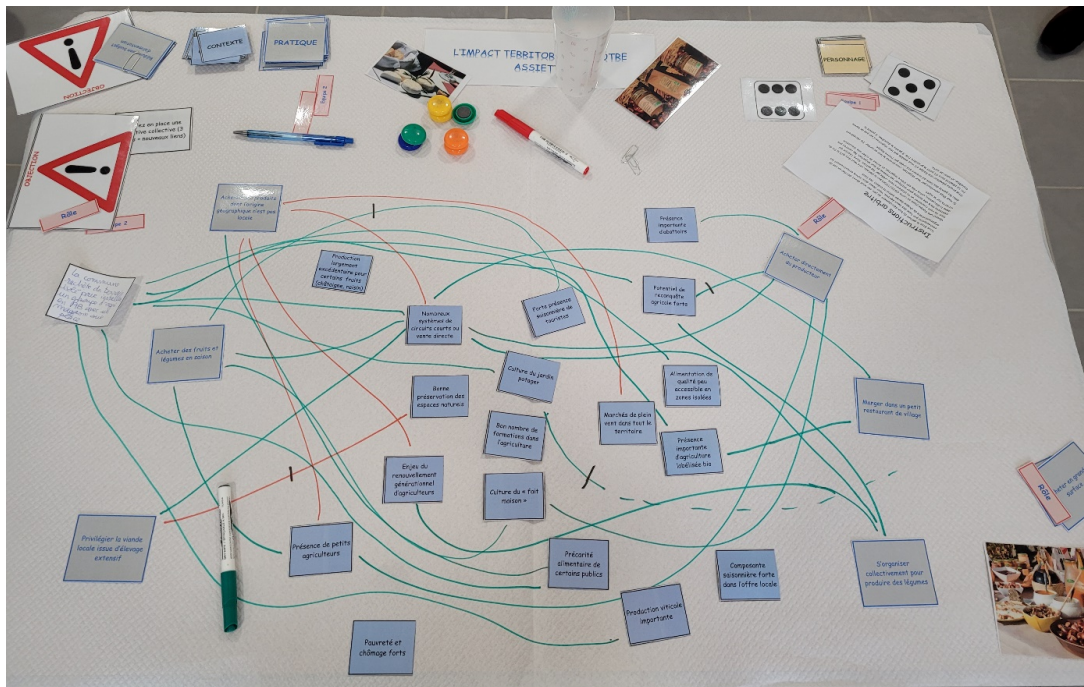


Fig. 4. Photo of the final board, Group 2.

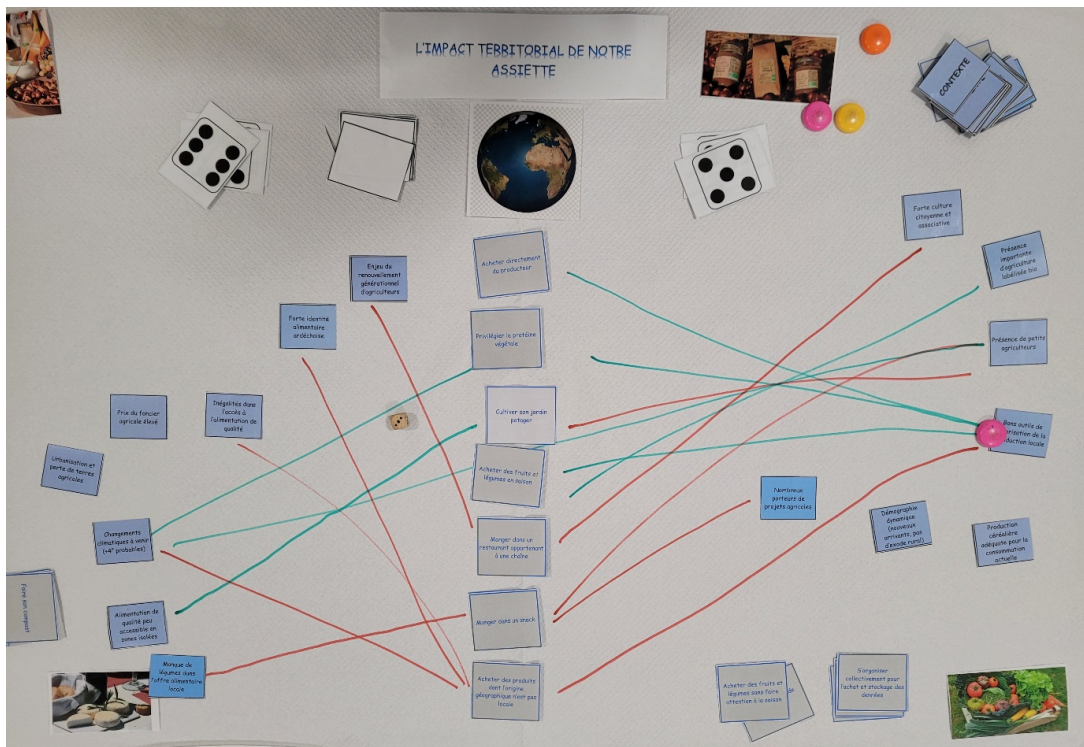


Fig. 5. Photo of the final board, Group 3.

## References

1. L. G. Horlings, D. Roep, E. Mathijs, and T. Marsden, 'Exploring the transformative capacity of place-shaping practices', *Sustain Sci*, vol. 15, no. 2, pp. 353–362, Mar. 2020, doi: 10.1007/s11625-020-00787-w.
2. C. Lamine, L. Garçon, and G. Brunori, 'Territorial agrifood systems: A Franco-Italian contribution to the debates over alternative food networks in rural areas', *Journal of Rural Studies*, vol. 68, pp. 159–170, May 2019, doi: 10.1016/j.jrurstud.2018.11.007.
3. T. Marsden, 'Sustainable place-making for sustainability science: the contested case of agri-food and urban–rural relations', *Sustain Sci*, vol. 8, no. 2, pp. 213–226, 2013, doi: 10.1007/s11625-012-0186-0.
4. OECD, FAO, and UNCDF, *Adopting a Territorial Approach to Food Security and Nutrition Policy*. in OECD Rural Studies. OECD, 2016. doi: 10.1787/9789264257108-en.
5. B. E. Carroll and F. Fahy, 'Locating the locale of local food: The importance of context, space and social relations', *Renew. Agr. Food Syst.*, vol. 30, no. 6, pp. 563–576, Dec. 2015, doi: 10.1017/S1742170514000404.
6. L. Hazard, 'Baser l'enquête sur l'expérience pour gérer les incertitudes d'une transition durable : le cas de la transition agroécologique.', in *Agora*, Éducagri éditions, 2018, pp. 23–41. doi: 10.3917/edagri.simon.2018.01.0023.
7. C. Béné *et al.*, 'When food systems meet sustainability – Current narratives and implications for actions', *World Development*, vol. 113, pp. 116–130, Jan. 2019, doi: 10.1016/j.worlddev.2018.08.011.
8. T. Marsden, 'From post-productionism to reflexive governance: Contested transitions in securing more sustainable food futures', *Journal of Rural Studies*, vol. 29, pp. 123–134, 2013, doi: 10.1016/j.jrurstud.2011.10.001.
9. D. Magda, C. Lamine, T. Marsden, and M. Rivera-Ferre, 'Taking into account the ontological relationship to change in agroecological transitions', in *Agroecological transitions, between determinist and open-ended visions*, in EcoPolis, vol. 37. Peter Lang International Academic Publishers, 2021. Accessed: Nov. 19, 2022. [Online]. Available: <https://digital.csic.es/handle/10261/279901>
10. A. Stirling, 'Emancipating Transformations', *STEPS Working Paper*, vol. 64, p. 48, 2014.
11. P. Herrero, T. Dedeurwaerdere, and A. Osinski, 'Design features for social learning in transformative transdisciplinary research', *Sustain Sci*, vol. 14, no. 3, pp. 751–769, May 2019, doi: 10.1007/s11625-018-0641-7.
12. J.-M. Douguet, P. Failler, and G. Ferraro, 'Sustainability Assessment of the Societal Costs of Fishing Activities in a Deliberative Perspective', p. 21, 2022.
13. B. Frame and M. O'Connor, 'Integrating valuation and deliberation: the purposes of sustainability assessment', *Environmental Science & Policy*, vol. 14, no. 1, pp. 1–10, Jan. 2011, doi: 10.1016/j.envsci.2010.10.009.
14. P. Lopez-Merino and C. Lamine, 'Towards a transformative sustainability assessment of territorial food systems: taking into account actors, interdependencies and trajectories', *Submitted to Ecological Economics*, submitted 2023.
15. G. Lazaroiu, M. Andronie, C. Uță, and I. Hurloiu, 'Trust Management in Organic Agriculture: Sustainable Consumption Behavior, Environmentally Conscious Purchase Intention, and Healthy Food Choices', *Front Public Health*, vol. 7, Nov. 2019, doi: 10.3389/fpubh.2019.00340.
16. G. Godin, M. Conner, and P. Sheeran, 'Bridging the intention-behaviour "gap": The role of moral norm', *The British Journal of Social Psychology*, vol. 44, pp. 497–512, 2005.
17. P. López-Merino and J. Rouchier, 'An Agent-Based Model of (Food) Consumption: Accounting for the Intention-Behaviour-Gap on Three Dimensions of Characteristics with Limited Knowledge', in *EasyChair Preprint 5440*, Dijon, France: Université Bourgogne Franche-Comté, Apr. 2021. doi: 2516-2314.
18. S. de Freitas, 'Are Games Effective Learning Tools? A Review of Educational Games', *Journal of Educational Technology & Society*, vol. 21, no. 2, pp. 74–84, 2018.
19. W. Medema, A. Furber, J. Adamowski, Q. Zhou, and I. Mayer, 'Exploring the Potential Impact of Serious Games on Social Learning and Stakeholder Collaborations for Transboundary Watershed Management of the St. Lawrence River Basin', *Water*, vol. 8, no. 5, Art. no. 5, May 2016, doi: 10.3390/w8050175.
20. E. Steiner, A. Dray, J. G. Ulloa, C. Garcia, and J. Ghazoul, "'I remember your lecture": role-playing games and unconventional teaching reinforce learning outcomes', *ETH Learning and Teaching Journal*, vol. 2, no. 1, Art. no. 1, Sep. 2020.
21. G. Butler, G. Pigozzi, and J. Rouchier, 'Mixing Dyadic and Deliberative Opinion Dynamics in an Agent-Based Model of Group Decision-Making', *Complexity*, vol. 2019, p. e3758159, Aug. 2019, doi: 10.1155/2019/3758159.
22. J. S. Dryzek and C. List, 'Social Choice Theory and Deliberative Democracy: A Reconciliation', *Brit. J. Polit. Sci.*, vol. 33, no. 01, pp. 1–28, Jan. 2003, doi: 10.1017/S0007123403000012.
23. N. Becu, 'Les courants d'influence et la pratique de la simulation participative', HDR, La Rochelle Université, La Rochelle, 2020. [Online]. Available: [https://collaboratif.cirad.fr/alfresco/s/d/workspace/SpacesStore/b183e2af-c1cc-474a-b301-aa57af816622/Becu\\_2020\\_HDR.pdf](https://collaboratif.cirad.fr/alfresco/s/d/workspace/SpacesStore/b183e2af-c1cc-474a-b301-aa57af816622/Becu_2020_HDR.pdf)
24. A. Ernst, 'Review of factors influencing social learning within participatory environmental governance', *E&S*, vol. 24, no. 1, p. art3, 2019, doi: 10.5751/ES-10599-240103.
25. T. Webler, H. Kastenholz, and O. Renn, 'Public participation in impact assessment: A social learning perspective', *Environmental Impact Assessment Review*, vol. 15, no. 5, pp. 443–463, Sep. 1995, doi: 10.1016/0195-9255(95)00043-E.
26. M. B. Murphy, G. Mavrommati, V. R. Mallampalli, R. B. Howarth, and M. E. Borsuk, 'Comparing group deliberation to other forms of preference aggregation in valuing ecosystem services', *E&S*, vol. 22, no. 4, p. art17, 2017, doi: 10.5751/ES-09519-220417.

27. B. J. M. de Vries and A. C. Petersen, 'Conceptualizing sustainable development: An assessment methodology connecting values, knowledge, worldviews and scenarios', *Ecological Economics*, vol. 68, no. 4, pp. 1006–1019, Feb. 2009, doi: 10.1016/j.ecolecon.2008.11.015.
28. V. Wibeck, K. Eliasson, and T.-S. Neset, 'Co-creation research for transformative times: Facilitating foresight capacity in view of global sustainability challenges', *Environmental Science & Policy*, vol. 128, pp. 290–298, Feb. 2022, doi: 10.1016/j.envsci.2021.11.023.
29. J. Peuch and A. Osinski, 'Governing the Transformation of Regional Food Systems: the Case of the Walloon Participatory Process', *Food ethics*, vol. 5, no. 1–2, p. 5, Nov. 2020, doi: 10.1007/s41055-019-00065-1.
30. H. Renting, M. Schermer, and A. Rossi, 'Building Food Democracy: Exploring Civic Food Networks and Newly Emerging Forms of Food Citizenship', *Int. j. sociol. agric. food (Online)*, vol. 19, no. 3, Art. no. 3, Dec. 2012, doi: 10.48416/ij saf.v19i3.206.
31. K. Collins and R. Ison, 'Jumping off Arnstein's ladder: social learning as a new policy paradigm for climate change adaptation', *Env. Pol. Gov.*, vol. 19, no. 6, pp. 358–373, Nov. 2009, doi: 10.1002/eet.523.
32. B. Siebenhüner, R. Rodela, and F. Ecker, 'Social learning research in ecological economics: A survey', *Environmental Science & Policy*, vol. 55, pp. 116–126, Jan. 2016, doi: 10.1016/j.envsci.2015.09.010.
33. E. Garmendia and S. Stagl, 'Public participation for sustainability and social learning: Concepts and lessons from three case studies in Europe', *Ecological Economics*, vol. 69, no. 8, pp. 1712–1722, Jun. 2010, doi: 10.1016/j.ecolecon.2010.03.027.
34. W. Daré et al., 'Apprentissage des interdépendances et des dynamiques', in *La modélisation d'accompagnement : une démarche participative en appui au développement durable*, M. Etienne, Ed., Versailles, Fr: Éditions Quae, 2010, pp. 223–250.
35. M. Reed et al., 'What is Social Learning?', *Ecology and Society*, vol. 15, no. 4, Oct. 2010, doi: 10.5751/ES-03564-1504r01.
36. M. van der Wal, J. De Kraker, A. Offermans, C. Kroeze, P. A. Kirschner, and M. van Ittersum, 'Measuring Social Learning in Participatory Approaches to Natural Resource Management', *Environmental Policy and Governance*, vol. 24, no. 1, pp. 1–15, 2014, doi: 10.1002/eet.1627.
37. C. Lamine and E. B. Noe, 'Values and Volume in Sustainable Organic Market Chains: A Multi-perspectival Analysis', *Int. j. sociol. agric. food (Online)*, vol. 24, no. 1, Jan. 2018, doi: 10.48416/ij saf.v24i1.113.
38. C. Dorninger et al., 'Leverage points for sustainability transformation: a review on interventions in food and energy systems', *Ecological Economics*, vol. 171, p. 106570, May 2020, doi: 10.1016/j.ecolecon.2019.106570.
39. D. Meadows, 'Leverage Points: Places to Intervene in a System'. Sustainability Institute, 1999.
40. C. Folke, T. Hahn, P. Olsson, and J. Norberg, 'Adaptive governance of Social-Ecological Systems', *Annu. Rev. Environ. Resour.*, vol. 30, no. 1, pp. 441–473, Nov. 2005, doi: 10.1146/annurev.energy.30.050504.144511.
41. M. Polanyi, 'Tacit Knowing: Its Bearing on Some Problems of Philosophy', *Rev. Mod. Phys.*, vol. 34, no. 4, pp. 601–616, Oct. 1962, doi: 10.1103/RevModPhys.34.601.
42. F. Kofman and P. M. Senge, 'Communities of commitment: The heart of learning organizations', *Organizational Dynamics*, vol. 22, no. 2, pp. 5–23, Sep. 1993, doi: 10.1016/0090-2616(93)90050-B.
43. J. Piaget, *Play, Dreams and Imitation in Childhood*. London: Routledge, 1951. doi: 10.4324/9781315009698.
44. R.-J. den Haan and M. van der Voort, 'On Evaluating Social Learning Outcomes of Serious Games to Collaboratively Address Sustainability Problems: A Literature Review', *Sustainability*, vol. 10, no. 12, p. 4529, Dec. 2018, doi: 10.3390/su10124529.
45. I. S. Mayer, 'The Gaming of Policy and the Politics of Gaming: A Review', *Simulation & Gaming*, vol. 40, no. 6, pp. 825–862, Dec. 2009, doi: 10.1177/1046878109346456.
46. G. Scholz, A. Dewulf, and C. Pahl-Wostl, 'An Analytical Framework of Social Learning Facilitated by Participatory Methods', *Syst Pract Action Res*, vol. 27, no. 6, pp. 575–591, Dec. 2014, doi: 10.1007/s11213-013-9310-z.
47. Q. Zhou, 'The Princess in the Castle: Challenging Serious Game Play for Integrated Policy Analysis and Planning', Ph.D. Thesis, Delft University, Delft, 2014. Accessed: Oct. 17, 2022. [Online]. Available: <https://repository.tudelft.nl/islandora/object/uuid%3A29ae9dce-0320-49d6-b5de-281b7aed1b3f>
48. C. Lamine et al., 'Transformations du système agri-alimentaire territorial en sud Ardèche : co-construire une périodisation du passé... qui fasse sens pour l'avenir', *Géocarrefour*, vol. 96, no. 3, Art. no. 3, Mar. 2022, doi: 10.4000/geocarrefour.20864.
49. E. Hassenforder, A. Dray, and W. Daré, *Manuel d'observation des jeux sérieux*. Montpellier, France: ComMod; CIRAD, 2020. doi: 10.19182/agritrop/00113.
50. J. Klabbers, *The magic circle: Principles of gaming & simulation*. Rotterdam: Sense Publishers, 2006.
51. E. Mostert, C. Pahl-Wostl, Y. Rees, B. Searle, D. Tàbara, and J. Tippett, 'Social Learning in European River-Basin Management: Barriers and Fostering Mechanisms from 10 River Basins', *Ecology and Society*, vol. 12, no. 1, May 2007, doi: 10.5751/ES-01960-120119.
52. V. Deldrève, J. Candau, and C. Noûs, Eds., *Effort environnemental et équité: Les politiques publiques de l'eau et de la biodiversité en France*. in EcoPolis, no. 34. Bern: Peter Lang International Academic Publishers, 2021. doi: 10.3726/b17992.
53. B. G. Norton, 'The rebirth of environmentalism as pragmatic, adaptive management', *Virginia Environmental Law Journal*, vol. 24, no. 3, pp. 353–376, 2005.
54. G. Brougère, 'Le jeu peut-il être sérieux? Revisiter Jouer/Apprendre en temps de serious game', *Australian Journal of French Studies*, vol. 49, no. 2, pp. 117–129, May 2012, doi: 10.3828/AJFS.2012.10.