Landscape Approaches, Wicked Problems and Role Playing Games

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Landscape Approaches, Wicked Problems and Role Playing Games

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ForDev Working Paper No. 01 / June 2017

The future of the tropical forests depends on our capacity to foster transitions in the way humans interact with these ecosystems. One of the largest challenges is to get insights in the different interests of the various stakeholders and the process by which it is possible to come to joint solutions.

We have developed models that couple ecological and social drivers of change in tropical forest landscapes. Transforming these models into role-playing games, we enable stakeholders to share and confront their perceptions, better grasp the complexities of the system, explore alternative futures in a low-risk environment, and negotiate new forms of collective action.

The paper presents our first attempt at using one such game to foster interdisciplinary discussions within the Green Livelihoods Alliance programme. The game is followed by a discussion about the drivers of change. Participants learn about themselves, about the others and about the system. We also tackle some of the most frequent questions participants ask when they first discover this approach.

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INTRODUCTION

The tropical forests stand at the cross-road. The combined and interacting effects of land-use change, resource extraction, defaunation and climate change are pushing these ecosystems towards critical points where transitions to altered states will happen. The future of these forests depends on our capacity to understand and anticipate these transitions.

The Gordian knot of these dynamics is the process by which a stakeholder decides to act. Two critical factors to consider are (1) the bounded rationality of stakeholders across scales, taking decisions with incomplete or flawed information, under situations of high uncertainty, and (2) their behavioural plasticity or the capacity to adapt their strategies to changing environmental and social conditions. These are defining elements of any social and ecological system, and ones that are notoriously difficult to represent with classical dynamic models.

Over the last 4 years, the ForDev (Forest Management and Development) group has developed models that couple ecological and sociological drivers of change in tropical forest landscapes. Transforming these models into role-playing games, we integrate these two critical factors, creating a boundary object - the role playing game- that enables stakeholders to share and confront their perceptions, better grasp the complexities of the system, explore alternative futures in a low-risk environment, and negotiate new forms of collective action. With fields in Colombia, Belize, the Congo Basin, Madagascar, India and Indonesia, we are working with local communities, NGOs, protected area managers, companies and governments to explore alternative futures and improve the resilience of tropical forest landscapes.

The Green Livelihoods Alliance programme aims at strengthening Civil Society Organisations in nine countries in the tropics through landscape approaches. One of the largest challenges is to get insight in the different interests of the various stakeholders and the process by which it is possible to come to joint solutions. We believe that there is scope to build synergies between our approaches.

METHOD

We use Companion Modelling (ComMod). It is a participatory approach using role-playing games and simulation models to tackle complex issues in the fields of renewable resources and environment management. It is in particular suitable for complex problems where a multitude of stakeholders have different and often conflicting views and interests. ComMod promotes dialogue, shared learning and collective decision-making, strengthening the adaptive

management capacity of communities facing wicked[1] environmental problems. In the ComMod approach stakeholders and researchers work together to develop a collective understanding of the social-ecological system and explore the issues at hand.

One of the critical components of the approach is the process by which a person playing the game takes on the role of a stakeholder. This has a profound impact on his or her understanding of the system, and has the potential to reshape its perception on the problem at hand. The experience plays a central role in the learning process. The approach belongs thus to the field of experiential learning, and differs from cognitive learning (emphasizing cognition over affect) and from behavioural learning (that discounts independent activities of the mind) (1). The best way to understand the strengths and limits of the approach is to take part in such a modelling or game process.

In view of this, we organized a two-day workshop at Tropenbos International, in Wageningen on May 22-23, 2017. The first day was devoted to a game session using the MineSet game developed by the CoForSet project and the ensuing debriefing. The second day was used to clarify concepts, explore how the ComMod approach can be of use to the Tropenbos International programme (specifically the Green Livelihood Alliances program) and to define a strategy for collaboration.

MODEL

Summary

MineSet is a model of regional landscape change developed to explore the future of tropical forest landscapes in Central Africa over the next decades. It places players in the roles of CEOs of logging or mining companies, interacting with markets, the government and NGos, planning their activities and developing strategies to cope with the environmental, economic and social impacts of their decisions (Fig.1). All the major underlying drivers of land use change in the tropics are featured: demographics, economical and finance signals, governance and transparency, technological changes, and cultural differences. As the game unfolds, the players discover the complexity of the system, and devise new rules and strategies to balance development and conservation. The model was developed through a series of stakeholder modelling workshops organised in France, Cameroun, Gabon and Switzerland between 2015 and 2017. The model is a component of the CoForSet project, funded by the Fondation pour la Recherche sur la Biodiversite (FRB) 2013 call for research proposals “Scenarios of Biodiversity for Sub-saharan Africa”, with support from the Fonds Francais pour l’Environnement Mondial (FFEM).

[1] See the Glossary: http://www.fordev.ethz.ch/research/glossary.html

Interaction diagram

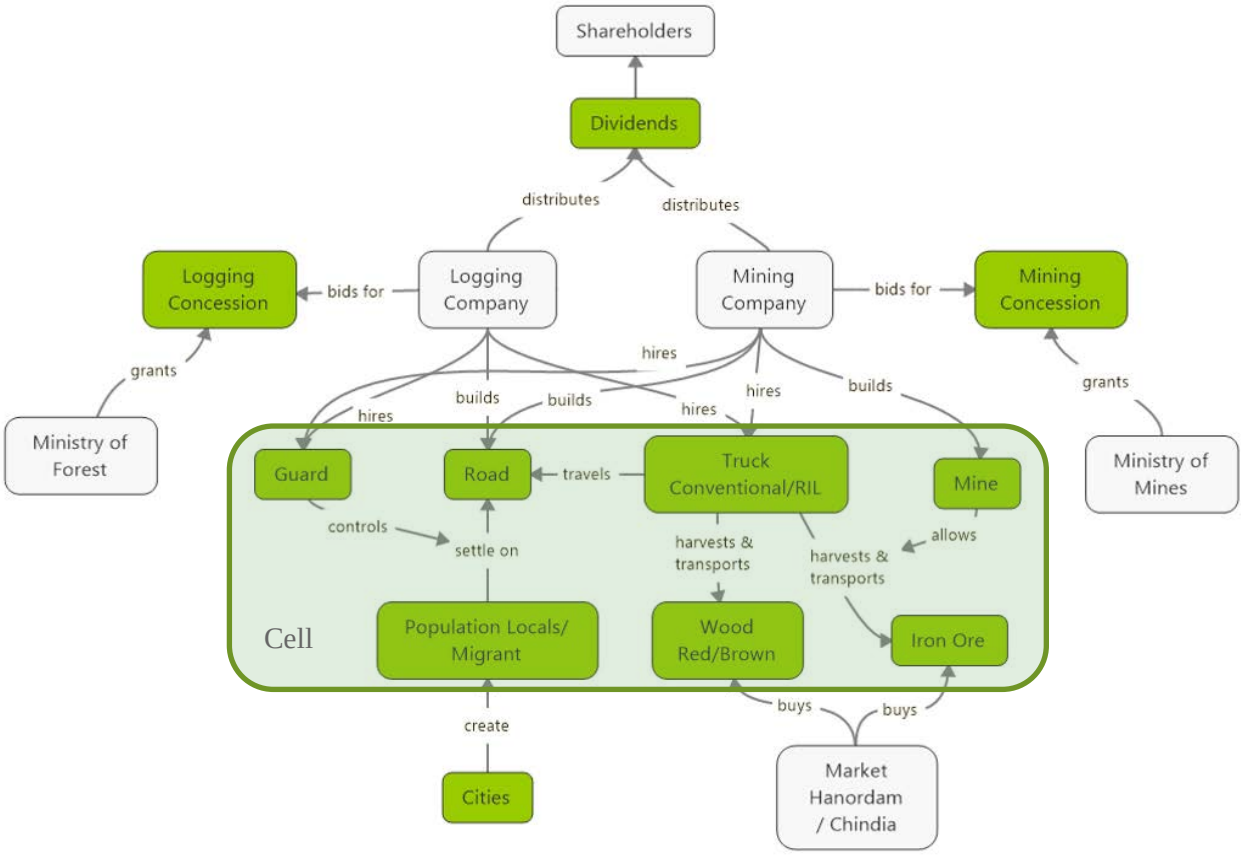


Figure 1: The MineSet conceptual interaction diagram. White boxes represent actors, controlled by players or by the research team. Green boxes represent resources. Most of the processes are located in the landscape, made up of a collection of cells (light green box). The arrows represent the possible interactions between all the model components.

Model engine

The rules of the game describe the economic, social and environmental processes at play in the system. Central to the model is the process of forest growth and the interaction between ecological processes and human activities. Each cell has a value of Forest cover (F) ranging from 0 to 10, represented visually with a different colour according to three broad land cover types (Tab. 3). This classification, developed independently, corresponds to a similar typology developed by the High Carbon Stock Steering Group (www.highcarbonstock.org).

Model components

Figure 2: The MineSet game. All the components of the system represented in the conceptual diagram (Fig. 1) are represented in a physical form. The hexagonal cells host roads, trucks, guards and populations. Players place the tokens based on their strategies and capacities. They negotiate agreements and alliances with other players or stakeholders represented by the research team.

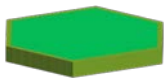
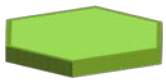
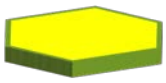
In addition, each cell has a Maximum Forest Cover (F_{max}) also ranging from 0 to 10. F cannot exceed F_{max}. Roads, local populations and mines reduce F_{max}. Logging directly reduces F, without affecting F_{max}. F will increase by 1 unit every turn, up to F_{max} . Plantations and sylvicultural practices will double the rate of forest growth. With these simple rules, we reflect the four processes of deforestation, forest degradation, forest natural growth and restoration.

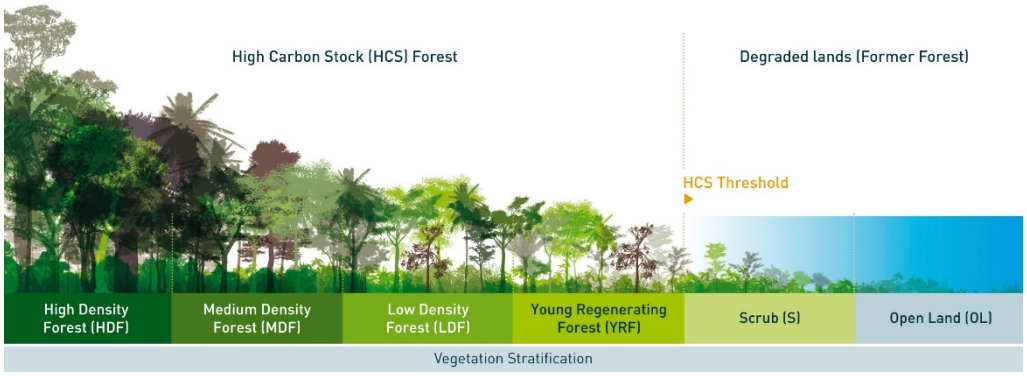
Biodiversity is explicitly taken into account in the model through the existence of noteworthy species / unique habitats, represent by tokens located on specific cells. Each of these tokens can be in three states: intact, threatened or destroyed. Based on the land cover type of the cell it is placed on, the token will shift from one state to the other. Transitions are reversible except the last one – a species/habitat destroyed is permanently lost.

Similar rules exist to describe human demography, market fluctuations, governance regimes and technological innovations.

Table 3: Forest Cover and the land cover typology of a cell in MineSet. The figure has been produced

independently by the High Carbon Stock Steering Group. Used with permission.

	High Density Forest	Low Density Forest	Open Forest Mosaic
Forest cover	10-9	8-5	4-0
Land cover type			



RESULTS

We placed the players in a situation that would let them discover the model complexity progressively. We developed a narration where the game begins in the 1960s. The initial landscape is completely forested with High-density forests on both sides of a single road connecting two nearby city centres. Human settlements – small holders and autochthonous communities - are present along the roadside. Teams of two players took charge of each of the 6 logging companies, all with a starting capital. After a first round of auctions for concessions, the teams start planning their operations, developing roads and deploying logging crews. The timber collected will be transported to the city and sold to the international market. The first impacts on the forest become quickly visible (Fig.1).

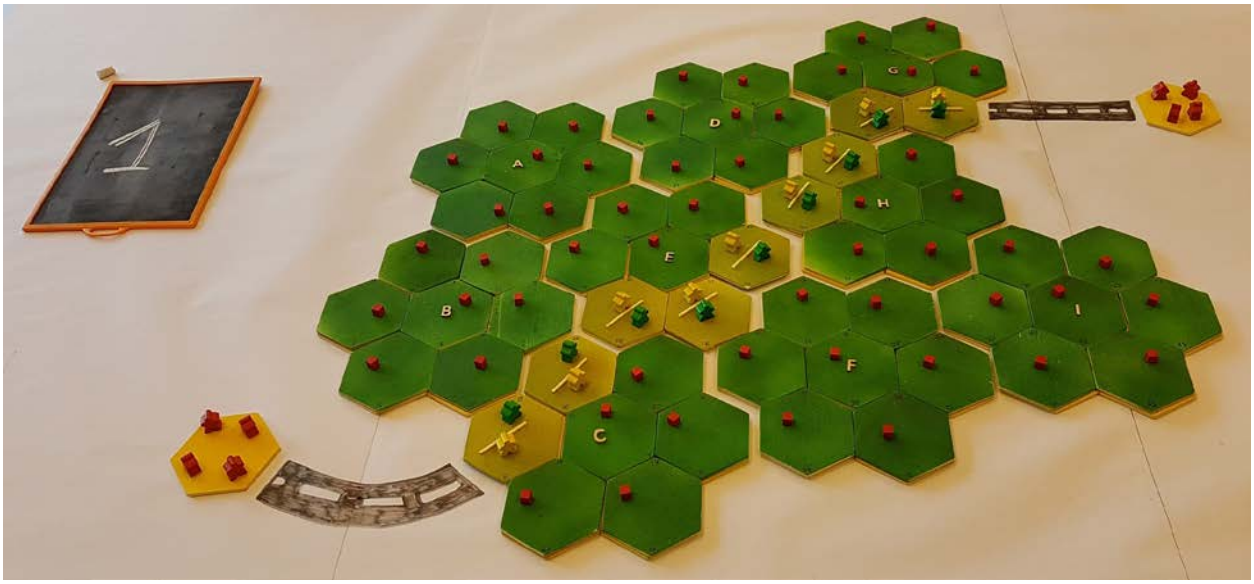


Figure 1: Landscape initial conditions (Turn 0). This is the landscape players begin with. All cells are connected, the gaps between units is a simple reminder of the concession limits.

Between 1960 and 1980, players expanded their road network, logging deeper in the forest. The new roads created space for settlers to move in from nearby cities. These developments begin to turn high-density forests into open forest mosaics (yellow cells) and biodiversity becomes an issue, with noteworthy species becoming threatened. A tipping point seems to be reached when large parts of the landscape suddenly turn yellow. Despite this, new business plans are developed, and players negotiate access to credit (Figure 2).

The expansion of logging activities continued unabated, bringing in its wake an ever increasing stream of migrants settling in the landscape. Conflicts start to appear, as the interests of the companies and of the local communities clash. Business dynamics shift when a new buyer (Chindia) starts to import forest products. The government auctions new concessions. Pressure groups advocate biodiversity conservation. Meanwhile some of the players contemplate the possibility to engage in the first mining activities and others pursue certification and forest restoration (Figure 3).

In addition to the landscape that is being transformed as the game progresses, we also monitor the evolution of a battery of indicators letting analyse the trajectories and strategies of the players. The game ran from 1960 to 2020. Over the five rounds played, logging activities increased sharply in round three, after which it slowly decreased again (Figure 4a). This reflects the possibility for players to get access to credits and expand their industrial projects. Different teams followed different logging strategies (Figure 4b).

Figure 2: Landscape on Turn 3. Almost 10% of the landscape has turned yellow (open forests mosaics), much to the surprise of the players who had not been monitoring the evolution of the forest cover of their concessions.

Figure 3: Landscape final conditions (Turn 5). At the end of 5 turns (about 50 years of activity), we observe a clear land sparing scenario, with two concession totally void of human pressure – through voluntary agreements exclusively, while the rest of the landscape is heavily modified.

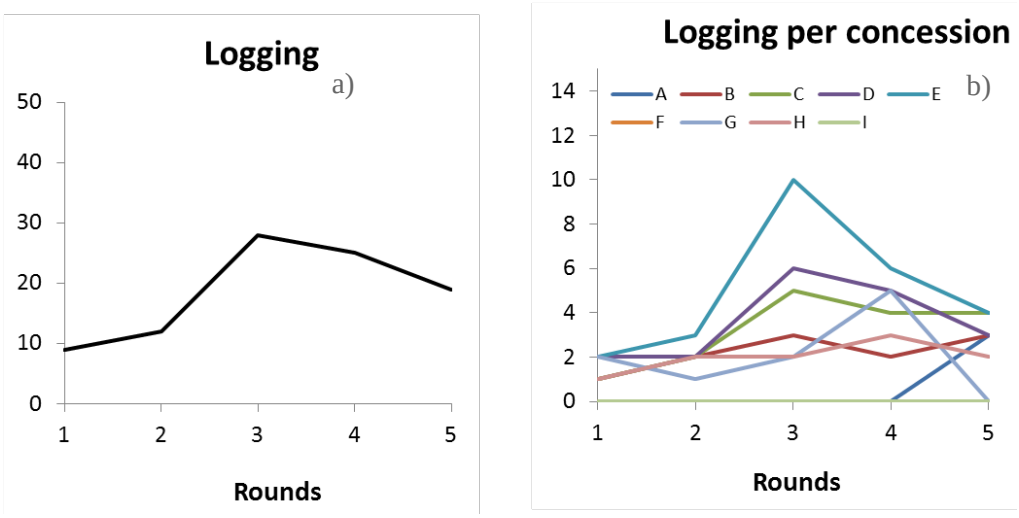


Figure 4: Logging activities over the duration of the game in the landscape as a whole (4a) and per concession (4b). The y axis represents the number of timber units removed from the landscape and sold to the market.

The impact of on the forest cover at the landscape scale can be monitored by adding the values of forest cover of all the cells in the landscape. The distinction between F_{max} and F lets us disentangle the impacts of deforestation (Total F_{max}, Figure 5b) and deforestation + degradation (Total F, Figure 5a). The accumulation of logging activities, road development and small scale agriculture continuously reduced the forest cover in the landscape over the rounds. In round 5, reduced impact logging and the first forest restoration activities resulted in a reduced forest degradation (Figure 5a). The impact of distinct logging strategies can be seen in the different concessions (Figure 5c,d).

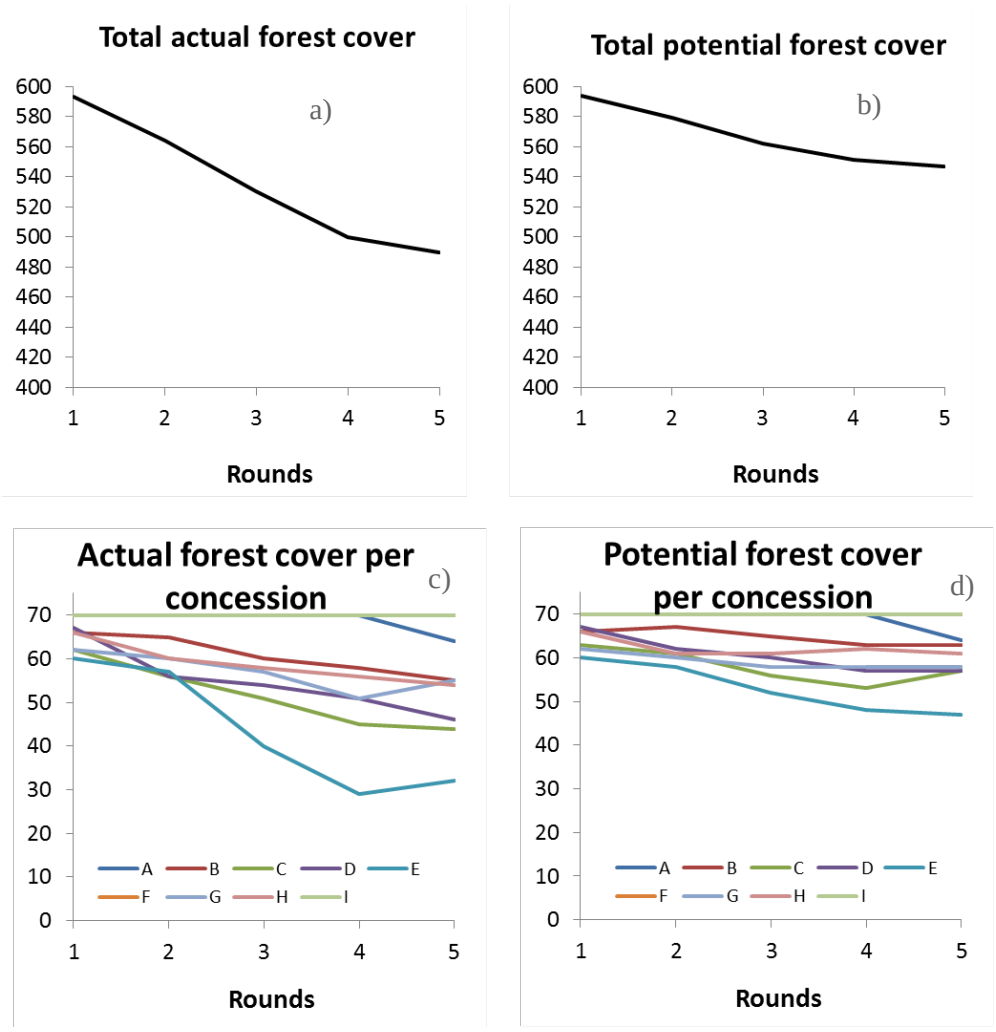


Figure 5: Evolution of the forest cover showing at the landscape scale deforestation and forest degradation (Total F, 5a); deforestation only (Total F_{max}, 5b) and per concession (Figure 5c, 5d).

Together with the evolution of forest cover, it is possible to monitor the extension of the road network, the settlement of migrants, at the landscape scale or per concession. (Figures 6a, 6b, 6c and 6d). Here again, the data per concession shows the differential impacts of the distinct strategies followed by each team.

Finally, there are other indicators that can be followed – the volumes traded per port, the evolution of the number of endemic species / unique habitats threatened, and the usual landscape metrics – mean patch size and perimeter length of the forest fragments. All these are part of the discussion that follow the game session.

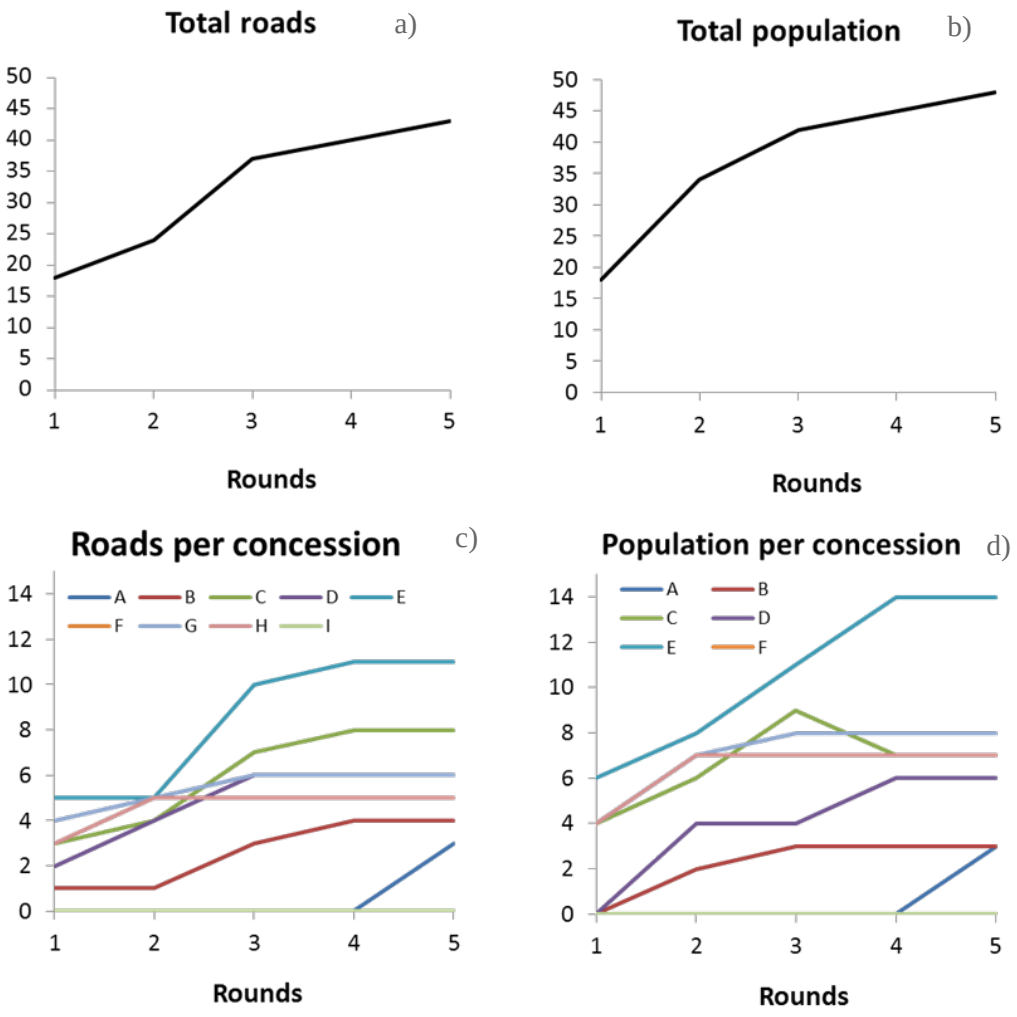


Figure 6: Total number of roads developed and population throughout the landscape (6a, 6b) and per concession (6c,6d).

DEBRIEFING

Learning begins when the game is over [i] (2, 3). This sentence, coined by David Crookall, professor at the University of Nice Sophia Antipolis, expresses the fact that the interest of the game lies the discussions that it will generate during and after the game session. We conducted the debriefing with the participants and generated outcome statements, feedback on the model and on the process and a series of questions requiring more in depth responses.

We discussed the impacts, surprises and challenges of the game played and about the use of games in Research in general. We have selected some of these statements by the participants to give a brief overview of the experiences of the participants of the Tropenbos MineSet game session. The quotes are verbatim transcriptions of the recorded session. We can classify the learning in three categories. Participants learnt (i) about the system, (ii) about themselves and (iii) about the others.

Learning about the System

> *I was surprised how the landscape in the game was changing in a similar way as the landscape in real landscapes. I realised "Oh we are playing a game, but all interactions in the game we see also in real life.*
>
> *I learnt how important the role of knowledge is. You only learn about/ feel the consequences of your actions the round after*

Learning about the Self

> *I was surprised that by my own behaviour in the game. I started off with a green heart, but I was drawn away by the money.*
>
> *I started off wanting to make some money, but then I realized it was not so smart*
>
> *I was just a bit surprised about the number of feelings that the game brought about, frustration. I did not feel in control, I felt powerless.*
>
> *I had this inner conflict between wanting to make money and conserving, doing the right thing*
>
> *I learnt that I was not so good dealing with many things in a limited time*
>
> *I learnt about chaos and what I'd do*

Learning about the Others

> *It was surprising that people choose so many different strategies*
>
> *I felt the collaboration and discussion did not come out as much as I'd expected. What I realised is that this required time investment and somebody that takes the lead is required for that.*

FREQUENTLY ASKED QUESTIONS

When we present our approaches, a few questions always surface. We address here the most common ones which also came up during the workshop.

How realistic is the game?

The question of realism in a modelling is not new, and was already discussed in Levin's seminal paper about the strategy of model building. When discussing a model's "realism", we need to clarify if we mean that the model describes with accuracy the causal links between system components, or if we mean the outputs of the model accurately describe real life outcomes (4). If the meaning of the question is the second one, then our games are not realistic. The landscape we create (Fig.5) is only an allegory of the real landscape of Central Africa. However, if the meaning of realism is the first one, a match between the causal structure of the world and that of the model, then, according to the statements of the participants themselves, "*all interactions in the game we see also in real life".*

Realism seems a desirable attribute for any model designed to help decision-making. However, the major difficulty when dealing with wicked problems lies not in understanding the bio-physical processes involved, but rather the values held by the various stakeholders, their segmented perception of the system, and their agendas, that at times appear to conflict, at other times genuinely do so (5). Thus, what matters with our games is to represent the stakeholders and their power and knowledge asymmetries. Precisely because a game session involves people, two major components of decision-making are constitutive to the model: 1. bounded rationality, i.e., the fact that a human is not a rational *homo economicus*, and 2. behavioural plasticity, i.e., the fact that we learn, cope and adapt when receiving feedback. Our games thus offer a realistic representation of the social component of any natural resources management problem. One that is notoriously difficult to capture in a classical model with standard approaches.

How do we know the behaviour in the game is real?

This question really means: "Do players exhibit the same behaviours than stakeholders outside of the game room".

Developing and using games that trigger realistic behaviour in participants seems crucial for both increasing our understanding of how the system at hand works as well reaching real change in stakeholders' perceptions and actions. Many authors have described the strong relationship between game and participants real life (6-8). This is connected to the previous question, "how realistic is the game?".

There are several ways to assess how realistic is the behaviour participants exhibited during game sessions. A debriefing session after a game is an essential step to discuss the dynamics during the game and how these dynamics relate to real life. Participants sharing their views and experiences from the game and reality, allows grasping how realistic the behaviour of the participants during the game was. Additional individual interviews after the game session allow discussing more in-depth how the dynamics in the game relate to real life. This will enable triangulation of the observations made during the game session.

But maybe this question is not that relevant. What does it matter if players act in the game in ways they would never do in the field? This is precisely what we seek to achieve after all, innovation and the exploration of possible futures beyond what we think can happen.

How easy it is to get people to the table?

As with many new methods and approaches, people need to trust that the new approach renders better results than the more conventional methods. In addition, as we will discuss later, games are seen as "not serious enough". This weakness of the approach is at the same time one of its strengths. The fact that a game setting is regarded as a not so serious and fictional makes it easy to interact and discuss issues in an open manner. We take people away from a situation of conflict to explore possible new ways of resolving it.

Starting the Companion Modelling process with a group of key stakeholders who have leading roles in their communities or associations will facilitate and strengthen the belief in the new method. The social network among the group of players seemed to influence the willingness to participate and the level of active participation in game sessions (8). However, difficulties of getting stakeholders to participate in game sessions have nonetheless been encountered and described by several authors (8-11). Therefore, in addition to a starting with a group of influential stakeholders, we recommend the use of the (i) snowballing method to decrease levels of absenteeism among invited participants and increase active participation during the game, or (ii) use an open informal invitation to all members of the community (11). In both cases, participants who actually show up can be grouped randomly, by ages, by roles or any other reasonable scheme required by the hypothesis to be tested.

Finally, if people see others at play, they will eventually come to the table. The accumulation of process using games as a discussion tool will strengthen the approach. In that sense, the Tropenbos Workshop is also part of a larger engagement strategy – that will continue with other

platforms such as the Global Landscape Forum or the Forest Stewardship Council.

How seriously do people take it?

Our games are fun! The fact that people can forget their daily problems and immerse themselves completely in the world proposed by the game is what makes such a powerful engagement tool. If the game session also involves lightness and laughter, participants continue to discuss the topics long after the session finished. A game will create a powerful emotional imprint on the participants, making it possible for them to refer back to what happened during the game weeks after the session. This is linked to the emotional responses players undergo when playing – beyond the rational and logic design of strategies, surprises, frustration and triumph, anger and joy, all can be experienced through a well-designed and well-run game session.

Yet learning through fun games is frequently regarded as not serious enough by the layperson. Reputational risks, difficulties to justify to superiors, donors and the taxpayer the allocation of time and resources, or other cultural barriers preventing adults from playing should not be underestimated. The use of “serious games” can be understood as a way to circumvent these barriers. Avoiding the term “game” altogether is often suggested as another approach – participatory exercises, scenario exploration focus groups, participatory modelling workshops… Some of us see this as self-defeating. This initial contortion undermines the mental disposition we seek to induce in the participants – creativity, collaboration, trust. Our games are games and they are fun.

Participants on the other hand generally take our games very seriously, particularly if the debriefing is well conducted. A clear sign of this is the frequent and extent of in-depth discussions on topics, issues and elements that are not part of the game, but were issues from real life discussed through the game (8). The often-vivid discussions during the game and the debriefing shows that the participants take these games very serious.

What does it change?

The ultimate goal of Companion Modelling is to help people make more informed decisions about natural resources management. To reach this objective, we often take a two-step approach. The first one is to understand the processes at play, the second to actually support the collective decision-making. No new knowledge will typically be created while the first objective is pursued, but the existing and often fragmented knowledge will be assembled and made explicit. ComMod generates models that are a collective mind map of the state of the art on the issue explored. These models say: “This is how we understand things to change. This is how we see the state of affairs of the world”. Such a proposition in itself will already be useful to the stakeholders. It is also a powerful way to identify knowledge gaps and define avenues for further research.

But that comprehensive understanding is generally not what is expected when we ask the

question of the impact of ComMod. The question seeks to hear about tangible changes the method generated. Truth be told, this is difficult to demonstrate. Participants report they had fun and learnt new things about the system, about themselves and about the others. Their mental models have changed, and we can communicate these statements and the behaviour exhibited during gaming sessions. We can also report the discussions held after the games. So what?

Here we are confronted to the same problem that all research institutions face when exhorted to demonstrate impact. Changes in the world have multiple, complex and often cryptic causes. It is a rare occurrence when a policy decision mentions the scientific paper that sparked the debate and even then, it might happen years after publication. More importantly, the outcomes ComMod generates often are not quantifiable or divisible. Attribution then is nonsensical. Using methods derived from Outcome Mapping and Harvesting, we are slowly building a library of “success stories”, where tangible change –new contracts, new policies, new infrastructures or new practices – can be credibly linked to ComMod and the game sessions.

The key to impact rests in who gets to play. There are three pathways of change when we develop a process. The first pathway involves the participants engaged in the process of designing the model and the game. It is a core group of leaders, agents of change and facilitators that will remain engaged in the process for a prolonged period. They will help shape and steer the process and the outcome will owe them a lot, for the better or the worse. In the process, they will gain in depth understanding of the complexity of the processes they are modelling and on the actors involved in it. The changes in perception will be profound, but this kernel is by necessity small - 5 to 10 people, often not more.

The second pathway of change flows through the learning process of the participants to the games. More games, more players. Learning will happen, but the transformation will be less than for those engaged in the first pathway. In that sense, the participants of the Tropenbos workshop are part of a cohort, and it would be possible to see if their practices and approaches to problems differ after the ideas that were discussed during and after the game.

Finally, the third pathway is the public, the audience that listens to the narratives we develop about our games. This is virtually global, but with the least transformational capacity. Game behaviour is not actual behaviour and internal validity does not translate into external validity. In addition, as we discussed, the cultural barriers will play here again, creating mistrust when we report findings.

Deciding whom to work with –transdisciplinarity - , whom to play with – engagement – and whom to talk to – monitoring – are the three critical questions to address when contemplating to use ComMod to bring about change in a system.

CONCLUSION

Video games have become one of the most dynamic sectors, leading technological innovation and attracting funding on an unprecedented level. The progresses of virtual reality and seamless interfaces promise new ways to escape reality. Gamification, the introduction of elements of play in everyday life, has gained traction in management sciences – as a way to lure participants to achieve pre-defined objectives. What we do with ComMod is radically different. We bring real life issues to the universe of gaming, as a way to better address these realities. We empower participants. We make them better strategists.

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APPENDIX - PARTICIPANTS

Table 1: Participants of the Tropenbos ComMod workshop

NAME	INSTITUTION	JOB DESCRIPTION
Roderick Zagt	TBI	Programme coordinator
Henk Hoefsloot	TBI	Programme coordinator
Hans Vellema	TBI	Programme coordinator
Trudi van Ingen	TBI	Programme coordinator
Rosalien Jezeer	TBI	Junior programme coordinator
Juanita Franco	TBI	Communication officer
Sietze van Dijk	TBI	Consultant
Stanley Walet	TBI	Consultant
Maarten Verboon	TBI	Intern
Nguyen Phuong Ha	TBI	Intern
Jan Kamstra	IUCN-NL	Senior Conservation Advisor
Maartje Hilterman	IUCN-NL	
Inge Vianen	TBI	Green Livelihoods Alliance coordinator

Table 2: Facilitators

NAME	INSTITUTIONS	ROLE
Carl Timler	WUR	Ministry of Forests
Mandy Doddema	WUR	GreenPanda
Giulia Salvini	WUR	Ministry of Mining
Erika Speelman	WUR	Global Forest Observer
Claude Garcia	ETH / CIFOR	Game Master

[i] This statement initially formulated by David Crookall, professor at the University of Nice Sophia Antipolis, is now the title of a paper we have published explaining the use of games for learning. https://doi.org/10.14512/gaia.25.4.13