Strategies to institutionalize companion modelling approaches

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Abstract:

Participative approaches are often viewed as an interesting way to promote the links between local and regional levels necessary to policy decentralization. Among those, the companion modelling (ComMod) approach aims at developing collective learning and at supporting decision making process by eliciting the different perceptions of a complex situation and by collectively exploring possible futures. This participative modelling and simulation approach has historically been developed and experimented at local level. But as many participative approaches, it has rapidly been confronted with the questions raised by the necessary inclusion of larger scale of decision. For instance, to which extend is it possible to transfer the collective knowledge developed to non-participants, or how to associate different types of stakeholders such as regulators? This institutionalisation of the approach implies up-scaling processes (transfer of the approach to higher decision levels), as well as out-scaling processes (dissemination of the approach and outputs to actors of the same level than the participants).

When considering the link between human and environment processes, it is now widely acknowledged that scales are social and political construct and that the organisation in level of the society is subjective. Furthermore, the perception of the dimensions to be accounted for varies from one actor to the other. Thus, according to the participation strategy, the issue definition, the representation process, the tools legitimacy and the mode of integration and comprehension of knowledge may differ.

This paper presents and discusses methodological strategies that have been tested in 14 experiences to institutionalise the ComMod approach. Participation, representation development and implementation methods, such as: participation of external actors at various moments of the approach, specific communication methods, development of generic tools and representations, training and formation are being reviewed.

The analysis of the cases study points out two main concerns in participative modelling institutionalization. First, one need to clarify what is to be institutionalized; It may refer to the transfer of a tool or of the approach in order to replicate it, to the appropriation of issue and its complex questioning, or to the integration of the outcomes into the organizations. Second, the approach participates to the power plays around scale issues among institutions. The issues, the outcomes, and the approach are scale dependent, and they all relate to the choices made in term of participation and/or representation. The integration of new actors in ComMod process may imply the collective redefinition of the issues and the development of new tools. Moreover, the scale choices of the representation may exclude some actors. The process outcomes are particularly difficult to transfer. Indeed, they relate to socio-political changes embedded in the social context and/or ephemeral collective learning. Efficient strategy to achieve the dissemination of these outcomes remains a research question. At last, the transfer of the approach itself is associated with high risks of normative and prescriptive drifts. It therefore calls for careful designed training processes

Keywords: scale change, companion modelling, participative modelling,

1. INTRODUCTION

Social processes regulating the relationships between societies and the environment operate in various dimensions (spatial, temporal, regulatory, demographic) and often at several levels (Cash, et al. 2006). The uses of a resource by individuals organized into social groups, the formulation of management rules, and more generally, the governance of ecosystems are thus defined at numerous levels and dimensions. Participative approaches are often viewed as an interesting way to promote the links between local and regional levels, necessary to policy decentralization. Among those, the companion modelling approach (ComMod 2006), also called ComMod approach, aims to develop collective learning and to support decision making process by explicating the different perceptions of a complex situation, and by collectively exploring possible futures. This participative modelling and simulation approach has historically been developed and experimented at local level, as it principally targeted out the users of the resources. Like many participatory approaches developed at the local level, the ComMod approach has been quickly confronted with the institutionalization of the participatory processes (Pimbert 2004). By institutionalization, we refer to the process of integrating the approach and its outputs in existing institutions and organization in order to change policies and practices. It entails the institutional integration of collective learning developed at a local level, taking into account stakeholders who are not present at the local level, and the need to directly interact with regulators and decision makers at broader levels. Social learning refers to the sharing and integration of knowledge through enhanced communication among actors, inter-relational learning and consolidation of social networks oriented toward action through the development of collective activities and relational practices. It lays the foundation for discussion or decision making, gathering different stakeholders who perceive the same resource management problem, realize their interdependence for solving it, and come together to agree on collective action strategies (Steins, et al. 1999). Institutionalizing ComMod approach is therefore directly questioning how social learning processes can address scaling up issues.

This paper presents and discusses methodological strategies that have been tested in 14 experiences to institutionalise ComMod approach. After pointing out the specificities raised by ComMod approach in term of scale issues and institutionalization, we review the diversity of developed strategies and their impact on power plays. The research questions raised by these strategies are then presented pointing out the importance of what is to be institutionalized: a tool, process outcomes or the approach.

2. INSTITUTIONALIZATION AS A MULTI LEVEL ISSUE IN COMMOD APPROACHES

Companion modelling is an approach based on social simulation to better understand the functioning of complex environmental system and strengthen the collective decision-making process of stakeholders sharing the associated common resources. This approach mobilises simulation models to integrate various stakeholders' viewpoints, and uses them as supports for collective learning. It is structured around different collective times, gathering scientists, heterogeneous local actors and/or technicians of institutions. Tools development and use mobilise two types of arena. The first type generally contributes to the building of the tools and participates to preliminary simulations. The second one is the deployment arena, where the results of the simulations are essentially presented and discussed. Overlapping between arenas often occurs; yet when there is a change of participant composition between the two arenas that may lead to the modification of the underlying conceptual and simulation model. Consequently the results of the approach are as much the simulation outputs as the discussion taking place in both types of arena. These outcomes result from the confrontation of the different points of view and the iterative testing of hypothesis through the modelling process and experienced by simulations.

In such an approach, the institutionalization that is the appropriation of the results can refer to the appropriation of the discussion processes and confrontation of points of view, of the tools, of the simulation outputs, and/or of the approach as a whole. It questions how the transfer is being done for each of these outcomes and the mechanism of appropriation. In Companion Modelling, the question of institutionalization is intrinsically integrated in the way the approach addresses the multi-level perspectives, meaning the way the different levels are taken into account within the tools and the participation forum. Both these aspects affect the transfer of knowledge to participants.

In the analysis of governance system, it is now largely accepted that scales are social and political constructs (Adger et al. 2005). They are affected by stakeholders' modes of comprehension and simplifications (Lebel et al. 2006). The legitimacy and understanding of knowledge are dependant on the level at which the knowledge was produced. Generic knowledge that are broadly applicable and produced by formal scientific procedures are often favoured at global levels, while lower levels mobilize knowledge based on practices or

situated experiences that are based on scientific procedures and traditional knowledge (Cash et al. 2006). Thus the choice of participants may affect the content of tools as well as their legitimacy.

A ComMod approach, which makes the elicitation of diverse viewpoints a central element, must pay special attention to integrating diverse ways of thinking, and to structuring action, particularly collective action, accounting for multiple levels. The multiple levels of organisation at which a ComMod process operates is just one of several cognitive representations of structuring action within a society, and this representation is not necessarily shared by all stakeholders. Contrary to a representation of a set of descending regulatory areas dividing society from top to bottom, society is a "continuum" (Rosenau 1992). Networks, lobbies, and social or personal ties associating stakeholders motivated by shared action principles and "behind-the-scenes" arenas (Goffman 1979) contribute as much to multi-level links as do the operational links between hierarchical levels of organisation.

3. REVIEW OF THE STRATEGIES MOBILISED FOR INSTITUTIONALIZATION IN COMMOD APPLICATIONS

Since the mid90's, multiple studies using ComMod approach have been done around the world to deal with the management of various resources, in different situations and social contexts. This led to a high diversity of methodology, which contrasts with a homogenous posture regarding modelling. As part of the research project ADD ComMod, 20 studies have been assessed in order to compare implementation modes and approach impacts. This comparison used interviews with the designers and the participants of the approach, as well as documents and monitoring material produced during each study (Jones and al. 2008). The evaluation methodology did not explicitly take into account questions related to shifting scales and multiple levels. Nevertheless these questions emerged in 14 cases. This paper is more specifically based on the analysis and description of the strategies of upscaling and institutionalization used in these studies and a previous study (Castella et al. 2007). A short presentation of each case is available at: http://www.commod.org/

3.1. Way and reasons to mobilize several institutions or levels of management

Multi-level integration is a recurrent issue in the case studied. It crops up in the choice of spatial and temporal scales and the levels of organization included in the tools, but also directly in the objective of the operation itself. Some interventions aim at helping one level of organization to better grasp another level, or other institutions than those it is used to considering (Table 1). Depending on the subject studied, what really is under discussion is a multi-institutional integration rather than a multi-level one.

Table **1**. Distribution of studies as a function of institutionalization means and institutional levels mobilised

Clear means for institutionalisation	Some means of institutionalization considered during the approach	Institutionalization means unclear
1- Lingmuteychu (at watershed level, considering irrigation schemes) 2- Samba (at regional level, considering farming system, village landscape or small watershed) 3- Domino Réunion (at regional administrative level considering municipalities) 4- Nîmes Métropoles (at regional administrative level, considering municipalities and consortium of municipalities) 5- Domino Sénégal (at regional level)	6- Pays de Caux (at watershed level considering plots) 7- Teraguas (at watershed level considering municipality and community) 8- Nan (at park level considering community and individual) 9- MaeSalep (at local administrative level considering community, collective and individual level) 10- Ouessant (at park level, considering individual) 11- SosteniCAP (at municipality level considering water users and water managers)	12- AtollGame (at national level considering island and land users) 13- Ndjoobarri (considering irrigation scheme, plot, no institutionalisation really looked for) 14- Agualoca (at watershed level considering sectorial water users) 15- Kataware (at watershed level considering sectoral water users)

In many cases, it was the question and its relation to the dynamic of the resource and institutions that determined the jurisdictional, spatial, and institutional levels considered. Interventions principally focused on the "local" level (the user as an individual) – or the "supra local" level (groups of users with a recognized representative) – and the immediate territorial and jurisdictional levels. Stakeholders from levels further away were occasionally associated. Only 4 studies actually integrated more than two territorial and jurisdictional levels. Levels other than those mobilized in the participation arenas were considered in the tools developed or the opposite. For example, the Nîmes Métropoles study only addressed the individual plot level in its GIS tool but not in the discussion models and participation arenas.

Multi-level integration was almost always a simultaneous process. The exceptions took into account of higher regional and watershed levels during the approach (study 1) or the integration of local authorities only once the users felt sufficiently comfortable (study 8 and 9).

3.2. Mobilising decision making levels from the start of the approach

Two studies (study 3 and 4) worked from the start at the public policy organizational level. They chose fairly similar strategies characterized by: an upstream mobilization of institutional support for the approach at the level of decision makers, its insertion into social networks at this level, and the differentiation between arenas in which tools are developed and those in which simulations are discussed. The first relied on technicians (or representatives of users) operating at the regional level under consideration, while the second directly mobilized decision makers (mayors, etc.). This decoupling allows more active participation of non-academic stakeholders in the modelling stage while allowing the effective participation of decision makers in the approach (the availability of these actors being more limited).

3.3. Institutionalization through direct up-scaling strategies

Evolution of an approach from a local level to a higher level with the aim of consolidating decision taking
In three studies (study 1, 8, 9) an official(s) was invited to participate to the role game session on request of participating actors. But the effective consolidation of decision making has depended on two elements. First, a favourable institutional context was necessary; notably the importance given to the participation of local stakeholders in decision making. Secondly, officials had to be assigned a role that matched their status (not as any other participants, nor as simple observers). The replication of discussion sessions at the same territorial level enables a "quasi statistical" extrapolation. Quantitative outputs and large scale results are particularly valued at a higher level of organisation and may therefore facilitate the appropriation and integration of results at this level. This approach was developed particularly in Vietnam where numerous games were conducted at a local level and the outcomes extrapolated to the regional level using GIS (study 2).

Adoption in a higher level of an approach developed at a local level
The participation of high level stakeholders either in the design of the tools or at the time of deployment of the approach (as players in a game or actors during the discussion phase) was not sufficient to ensure the transfer. Only once, the appropriation of the approach directly resulted in its adoption by certain high level stakeholders that had been mobilised as observers at one steps of the process (study 4). But the cost of replication of the approach actually limited its effectiveness. In Bhutan, this transfer resulted from the (re)-integration of the designer of the approach in the governmental institution. In other cases, institutional representative's attitude, which was reserved for personal (study 8) or institutional (study 10) reasons, prevented further appropriation.

Finally, in some cases, it was proved very difficult simply to mobilize representatives from a certain (organizational) level in the approach. To overcome this difficulty, "demonstration" sessions were tested in higher level arenas. That was the case in the Teraguas study for instance; but without a direct confrontation with representatives from lower levels, the validity of the representation that promotes the issues as they are expressed at a lower level was called into question. The tool was only perceived as a training tool for the organization's technicians who operate at a local level.

3.4. Complementary strategies mobilized to contribute to institutionalization

Mobilization of a large group of users by replication of the simulation sessions
It focused on a single stage of the approach, generally the discussion and simulation workshops. One can repeat a role playing games session with new participants in order to have a good representation of the public diversity in the territory. That strategy can eventually be coupled with a "sampling" of stakeholders or environmental situation that is meant to ensure a "good" representation or a good territorial cover. For example, in the Nîmes Métropoles study, designers sought to mobilize at least one elected official or representative of each municipality in the game sessions.

Diffusion of outcomes to a large group of users
The dissemination of outcomes may be important to guarantee the legitimacy of the intervention and to promote the appropriation of results. Most of the time, this dissemination is done through standard practices of communication of the approach up or downstream. This dissemination concerned informations, elements of the problem, outcomes, and possibly discussions and products by mobilizing social networks and diverse

communication mechanisms and mediums. Only two approaches (8 and 11) tried to focus on the dissemination of the discussion or the confrontation of viewpoints. The Nan study proposed to play a game session gathering virtual and real players; the latter had to explain to the village audience their strategy. But outcomes of this experience, which gathered a small number of participants, were not assessed in details.

Others chose to present the results of work made in small groups in a legitimate "ratification" arena (a general assembly of users, for example) with the aim of validating them (11). This was more effective when the restitution was directly made by participants. In one case, it was chosen to present not the effective consensus but the debate over conflictive issue.

Development and use of generic tools
Given the transaction costs of certain stages in the companion modelling process, notably for developing the tools, the development of generic or de-contextualized tools is viewed as a way to facilitate replication experiments either at the same level or at other level.

For example, in the Teraguas study, the reproduction of the approach was planned at the beginning of the process given the large number of concerned stakeholders (residents of a suburban zone). The generic character of the role playing game lies in the integration of the heterogeneity of the perceptions, and the representation of generic processes (particularly the biophysical ones). Thus the game includes various issues related to land and water management in the context studied. The approach also mobilised simple tools (drawings, theatre, and cards) that helped to structure rapid discussions around key points of the conceptual model. These tools can be rapidly adapted to the diversity of local situations, which have been previously described. The a posteriori review of the underlying model assumes that the variability has been sufficiently well assessed and included in the game. This strategy permitted the successful replication in two situations with different questions. But the assessment of the perception on a large basis is time consuming, and may lead to favour one type of actor or of level among others. Moreover the integration of different perceptions may lead to very complex tool.

Other approaches preferred to focus on existing concepts and theories to build the tools. This was the case of the simplified game used in the Lingmuteychu study, which emphasises the articulation between collective and individual water resource management using a virtual scenario. This type of tools is more easily transferred to different levels and institutions.

4. DISCUSSION AND CONCLUSION

4.1. Appropriation of the issues, the outcomes or the approach

Institutionalization can refer to the transfer of different elements of the approach. It can concern the exchange of knowledge and the confrontation of viewpoints, including those of the newly mobilized institution. But it can also mean the integration of learning within the institution in order to change its practices or engagement in decision making. In some case, the institutionalization of the issue, which is the appropriation of the way the issue is being questioned, and of the different points of views are more important than the appropriation of the outcomes. The mobilisation and consolidation of a socio-technical network, for example the collective development of book or seminar, can be an effective strategy for this objective. In other cases, it is rather the appropriation of the outcomes, such as a decision, that is wanted. This appropriation might require the validation of the outcomes by an adequate legitimisation body (general assembly of users or legislative chambers), but it often includes being put again into discussion and possible changes. Much is also related to who is in charge of bringing the issue and the way it is presented.

Besides, higher level stakeholders are often part of complex and/or hierarchical organisations with responsibilities spread among several persons or services. The participation of the organization may be required for different objectives simultaneously, such as to confront knowledge on the system, to transfer the different outcomes, or to engage the institution in decision making. Thus different services or individuals may need to be mobilized. Whatever the objectives are, and even if participants hold a clear and well defined mandate, feedback mechanisms within the organisation are necessary to facilitate institutional learning. For example, the approach may include parallel activities focusing on the internal mobilization of the organization.

The transfer of the approach itself is more complex, and supposes that the institution already shares the posture of the approach to avoid a normative implementation or the instrumentalization of the approach. It means that a close collaboration with the institution has taken place well before the question of institutionalization is raised. It also raises the question of the training methodology that should focus more on

questioning than guidelines in order to provide organization members the capacity to adapt to different situations.

4.2.   Scaling-up issues and politic of scales

Institutionalization by the mobilization of higher level actors in the approach participates to the politic of scales. It illustrates how the choice of scale can be an inclusionary or exclusionary instrument of power that modifies the means of access to resources and decisions (Lebel et al. 2006). Indeed, in any intervention, the choice of initial participants and the dominant cognitive model of the intervention shape the representation, the underlying hypothesis, the way the question is being laid and the dynamics considered. These different aspects may contribute to legitimize certain organization, reinforce the conception of the scale structure (for example, political-administrative) and may facilitate the exclusion of some actors. It thus affects the power struggles around scales.

This is all the more important to consider than stakeholders from higher levels are often in position of dominance. Consequently the way the articulation with other stakeholders is organized during the institutionalization process is important to consider. For example, integrating an outsider by a mere participation as observers has rarely produced encouraging results and may even be dangerous by promoting the unilateral unveiling of local strategies.

It is risky to deploy a tool in a discussion arena mobilizing levels that are distant from the territorial ones where the tool was designed. Indeed, changes in level accompanies changes in representations, underlying hypotheses, questions and considered dynamics. This risk is even more important when direct dialogue with local representatives is limited or impossible (no local representatives, or difficulty of local representatives to express themselves when facing dominant actors). Moreover, actors with different territorial references than the ones included in the tool are less likely to understand the dynamics considered and their simplifications in the model.

4.3.   Questions raised by the replication of the approach

Replication of the approach is viewed as a way to ensure the legitimacy of the approach or outcomes through the mobilization of a large group of users. Given the mobilising capacity of the tools and the transaction cost of simulation workshops, ensuring the involvement of a significant number of people can be difficult or even impossible to carry out. Resorting to a "sampling" strategy or the mobilization of "champions" and their social network assumes that the representations used are valid for all the targeted population or that the variability of the representation within a population have been correctly taken into account. The autonomous development of the method by non-expert third parties allows the multiplication of the approach but is accompanied by the risk of normative and prescriptive drifts and supposes the institutionalization to have already taken place. Another difficulty is that the multiplication of experiences may lead to the development of different discussions and scenarios, raising the issue of their confrontation and sharing.

4.4.   What role for generic tools?

The representation of biophysical processes had led to development of a set of tools and methodologies acknowledging the link between spatial and temporal scales. Yet, multilevel social interactions in natural management and social forms of emergence are a more recent preoccupation, and the analysis of social processes most often favours descriptions at a single level. Several analytical frameworks, for example the Institutional Analysis and Development Framework (Ostrom 2005) or the Agent-Group-Role concept in modelling (Ferber, et al. 1998) have questioned the way the society partition into levels have been intuitively done.

Scientific knowledge leans towards the generic, or that is applicable to diverse contexts. A move towards abstraction is expected to provide an opportunity to derive tools that can be used in different contexts and at different levels, that is may be more easily institutionalized. But "generic" may refers to "inclusive" representations, allowing all variants of a process to be represented regardless of the context, or "exclusive", where only invariants of these processes are represented. Inclusive perception assumes that the heterogeneity of perceptions within the targeted groups of stakeholders was adequately understood and integrated in the tools. The second one is based on identifying underlying management principles either through simplification of existing tools or collective identification of principle.

This type of approach may however lead to approach and tools close to those developed as part of the experimental economy at the risk of discarding some key principles of the companion modelling approach.

Though the interest of research of such generic tools is not questioned, some stakeholders may question the relevance of their participation in the development of generic model not directly suitable for decision making in operational situations. Adaptation of the tools to fit local specifications could be necessary to avoid this problem, but it raises the question of how this adaptation can be effectively carried out by non-expert third parties.

4.5. Conclusion

As a rescaling process, institutionalization supposes the integration of new actors with different implication in the process setting. It may as well imply the collective redefinition of the issues and/or the development of new tools. The process outcomes are particularly difficult to transfer as they relate to either socio-political changes embedded in the social context and/or collective learning. A strategy to achieve an efficient dissemination remains a research question. Besides, the transfer of the approach itself is associated with high risks of normative and prescriptive drifts that call for careful designed training processes.

Several mechanisms and strategies have been explored in the reviewed experiences. They underly the different institutionalization options, the role of power plays in the outcomes of the process and the questions raised by different re-scaling strategies due to the focus on the variability of representations and discussion processes. This diversity is in line with the need to keep a flexible approach able to adapt to the environmental, economical, social and political specificities of each situation, which is one of the key features of ComMod approach. It remains to better understand (1) what strategies are most adapted to what contexts and (2) how these strategies affect the power plays around scales issues among institution as neither the issues, nor the outcomes, nor the approach are scale free; and they all relate to the initial choices made in term of participation and/or representation.

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