‘Tips and tricks’ of participatory land-use planning in Lao PDR: Towards a land zoning negotiation support platform.

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Abstract: Managing complex landscape mosaics in areas dominated by poverty often requires addressing conflicting objectives and managing trade-offs, e.g. between maintaining/enhancing ecological functions and improving livelihood. Laos, like many other developing countries depending on agriculture and natural resources for the subsistence of a mostly rural population, has used land-use planning (LUP) as a core policy instrument towards sustainable development. However, previous reviews of LUP implementation showed large discrepancies between policies and practices and between the intended goals and actual outcomes. There is a need for increased participation, improved integration of scales, harmonization of superimposed plans, and enhanced coordination between implementing agencies and other stakeholders. As a consequence, former normative approaches to LUP have been gradually replaced (at least on paper) by a new paradigm. Participatory land-use planning (PLUP) has recently become one of the flagships of donor-supported programs in developing countries.
Despite the good intentions of PLUP principles, the implementation remains entangled with confused ‘on-the-ground’ issues that compromise effective participation. As alternative to complex ‘high-tech’ LUP models that local stakeholders are not able to use and replicate, a communication platform supporting negotiations among multiple stakeholders groups has been tested in a village cluster of Luang Prabang Province in northern Laos. This innovative approach based on a combination of role playing game, participatory 3D modeling, GIS and socioeconomic and environmental impact assessment, allows stakeholders to collectively explore the consequences of land-use decisions and to choose between alternative future landscapes.

Keywords: Participatory land-use planning, communication platform, Geographic Information Systems, role-playing games, Participatory 3D Modeling, Lao PDR

1. Introduction

Described as an activity that envisages future land arrangements, land-use planning has been recognized, over the past two decades, as a key instrument for achieving sustainable development. After an international success since the 1960s, land-use planning policies are still recognized for their capacity to improve the livelihoods of forest-dwelling communities by ensuring sustainable land-uses, prerequisite to poverty alleviation (FAO, 1993). Participatory land-use planning (PLUP) has the mandate to achieving the balance between

development needs and the preservation of the rural environment, in order to lead to a sustainable management of the landscapes (Maginnis et al., 2004, Sayer, 2009, Sayer and Campbell, 2004, McShane and Wells, 2004). A key innovation in PLUP appears to be the 'P' of 'Participation'. Nonetheless, the concept is not recent and dwell embedded in the sustainable livelihoods and development paradigms of the late 1980s and early 1990s (WCED, 1987, Chambers, 1994, Chambers and Conway, 1992). Its popularity has not declined since then (Neef and Neubert, 2010). From an ethical angle, incorporating a participatory component in land-use planning aims at avoiding a potential 'top-down' imposition of pro-development interest holding sway over planning decisions (Rydin, 1995). From an instrumental perspective, enhanced participation in planning is expected to engender wider public support and facilitated implementation of the plans (Macnaghten and Jacobs, 1997). Encouraging sustainable resource management by local communities, a large range of PLUP approaches have been developed and tested in many developing countries. Scientific articles and grey literature have reported on the theoretical appeal of the notion, but also usually concluded with the difficulties of truly applying it on the ground to reach its ambitious goals. In fact, the lack of methodological standards seems to hinder the practical implementation of land-use planning principles (MAF-NLMA, 2009, Kaswamila and Songorwa, 2009, Fox et al., 2008). In the reported cases where PLUP methods are presented, actual on-the-ground activities are usually conducted under the implementers' own interpretation of the guidelines, creating a diversity of implementation pathways under the same overarching concept. Hessel et al. (2009) for example showed in a case study in Burkina Faso that the link between spatially-explicit mapping and socio-economic data was bypassed and while their outputs could trigger useful discussions, the level of accuracy reached could not guarantee further use by local communities. Other PLUP experiences have been described by Fox et al. (2008) in Cambodia where planning was limited to a participatory mapping exercise with local communities. Beside addressing the land and tenure issues at a village scale, inter-village conflicts could not be visualized. Many other PLUP-related research developed non-spatial and theoretical scenarios that did not aim at being implemented (Hoang Fagerstrom et al., 2003, Marchamalo and Romero, 2007).

Since the early 1990s, a Land-use Planning and Land Allocation (LUP/LA) program has been implemented throughout Lao PDR. By increasing land tenure security, LUP/LA was expected to encourage agricultural intensification, favor private investments and the development of commercial on-farm productions and, importantly, stabilize shifting cultivation and preserve the country's forest, soil, biodiversity and water resources (Lestrelin, 2010, Vandergeest, 2003, Fujita and Phanvilay, 2008). Through these processes, the central government formally recognizes customary rights to use natural resources and provides local institutions with important responsibilities, e.g. land distribution, registration and tax collection, monitoring and conflict resolution. Hence, in line with the sustainable development paradigm, greater consideration for local claims, knowledge and institutions was expected to bring about more balanced and environmentally sound development trajectories (WCED 1987, UNCED 1992). However, according to various studies, the implementation of LUP/LA in Laos did not always encounter the success predicted by the Laotian authorities (Lestrelin and Giordano, 2007, Ducourtieux et al., 2005, Fujita and Phanvilay, 2008).

One of the reason for these poor achievements is the gradual complexification of Laos' land-use planning (LUP) system resulting from two concurrent processes: a multiplication of the actors involved in LUP – each one with its own mandates, priorities and approaches to planning – and a sustained, yet not necessarily coordinated, effort for improving previous policy (Lestrelin et al., 2011a).

A more positive trait has been the flourishing of new LUP instruments reflects partly a sustained effort of the Government of Laos (GoL) and its international development partners for improving planning approaches and importantly, adapting them to reported deficiencies, emerging issues and changing concerns. This is illustrated by the evolution of village-level LUP where each new instrument is presented as an improvement of the previous ones (Lestrelin et al., 2011b). Since the mid-1990s, LUPLA mandate has gradually expanded by including individual land allocation procedures and monitoring (LSFP 1997, 2001). More recently, PLUP has emerged in replacement to LUPLA in order to provide a more participatory and integrated planning process at the village cluster level (MAF-NLMA, 2009). However, the premises of PLUP in Laos scrutinized by Lestrelin et al. (2011b) appear to repeat the mistakes of the past with inappropriate on-the-ground practices undermining thoughtful (inter)national guidelines. The authors concluded that solely highlighting the need for more participation could neither increase local participation nor affect local land-uses in pilot initiatives of PLUP. In practice, limited facilitation skills and implementation capacities of land-use planners together with the absence of constructive feedback loops imposed considerable limits to local communities participation and inclusion of local perspectives.

Based on the review of past LUP experiences in Lao PDR (Lestrelin et al. 2011b), this paper proposes a methodological framework for implementing participatory land-use planning in accordance with the main principles defined by the national agencies in charge of the implementation, i.e. the Ministry of Agriculture and Forestry (MAF) and the National Land Management Authorities (NLMA). The method is then illustrated by a case study conducted in Viengkham District of Luang Prabang Province. Finally, lessons are drawn from this experience and the conditions for generalization of this innovative approach to the national level are discussed.

2. Revisiting the principles of PLUP: participation and integration

The manual on 'Participatory Agriculture and Forest Land-use Planning at Village and Village Cluster Level' was prepared by the two government agencies in charge of land management, i.e. MAF and NLMA, to coordinate their efforts into a standardized approach to PLUP that could be applied consistently by their respective line agencies at the province and district levels. Building on the knowledge of disappointing past attempts (i.e. LUPLA), the guidelines intend to provide appropriate adjustments in a context of strong governmental ambition to participate in globalized trade and investment through the engagement of rural areas in a market-based economy. The improved PLUP approach has been built on these principles, i.e. participation and integration, to ensure consistent field application.

Participation

The manual highlights the need to improve the participatory nature of LUP and advocates that the elaboration of land-use plans should be directly derived from the villagers' views. The land management activities should also be adaptive and allow for different ethnic groups to voice their needs with an equal representation of women and men in the different stages of decision-making. Prior to the zoning process, village rights to exploit natural resources and modify their landscape through land-use planning have to be clarified for the entire village community. In fact, the main promise of involving local communities in land-use planning is to prevent deviant uses by local elite and influential individuals of corporations, to exert control over natural resources, e.g. case of land grabbing have been reported in conjunction with land-use planning implemented with the support of foreign investors (Baird, 2009).

Besides, the aim is to drive the process with the people that will be the most affected by the outcome and can provide knowledge that will fit into the local frame (Ericson, 2006). Participation is also essential because it provides local scale information and intends to "encourage the construction of a common vision for sustainable regional development" (Valencia-Sandoval *et al.* 2010:65). Furthermore, by improving villagers' capacity to influence local processes and fostering decisional empowerment amongst the poorest, local participants gain the ability to negotiate with government representatives which redesigns the power balance. Within the communities it also gives visibility to the whole range of stakeholders and contributes to balance gender, social and economic status, and ethnicity.

Integration

Coping with scales, knowledge and multiple stakeholders' perspectives is in the mandate of land-use planners, but while integration is recognized as an important principle, it often remains at the recommendation stage on the ground (Lal et al., 2001, Gunarso et al., 2007). PLUP has therefore a reaffirmed ambition to efficiently translate integrative concepts into local land management plans. The sub-district perspective of PLUP is assumed to mitigate inter-village conflicts and support collaborative management between villages of a same *kumban* (or village cluster). Border conflicts between villages often emanate from past relocation policies clustering villages along the road or merging small villages into larger administrative units. In addition, tacit agreements over land-use exist between neighboring villages which justify integrating land-use planning at multiple scales from village to village cluster and district.

The participatory nature of the process entails the integration of different types of knowledge. Indigenous knowledge, widely praised for its local relevance, should lean on scientific expertise in terms of global processes affecting land-uses. The use of advanced geographic technology through Global Positioning Systems (GPS) and satellite imagery is also promoted by the PLUP manual to avoid mapping irregularities (MAF-NLMA, 2009). Knowledge integration has the potential to better inform negotiation and facilitate multi-actor landscape planning (Opdam et al., 2006). However, combining "hard" scientific data with local expertise can be challenging as local stakeholders might not understand the consequences of their decisions and could be manipulated by those who better understand the issues at stake, i.e. land-use planners and local leaders (Kitchin and Dodge, 2007). Rather than using "outsourced" data likely to be locally distrusted and/or rejected, the knowledge used to make informed decisions should be generated through social interaction involving layman stakeholders. Facilitators of such collective process have then to frame the knowledge into meaningful "boundary objects" that become the main supports for multi-stakeholder negotiations in search of land management compromises (Von Haaren, 2002, Treu et al., 2000, Jasanoff, 2007).

3. Case study site

In the uplands of Laos like in many other developing countries, agriculture and natural resources represent livelihood mainstays for the rural population. Subsistence farming by shifting cultivation is predominant due to low accessibility to roads and markets although slash and burn practices are denounced by the Government as being "primitive, unproductive and harmful to the environment"(Haberecht 2009:29). In Viengkham district, like in many other remote upland areas, PLUP is considered as a key policy instrument of the government to accelerate the on-going transition from subsistence to commercial agriculture. While being

ranked among the poorest districts in the country, Viengkham district borders the second largest protected area in the country (Nam-Et Phou Louey National Protected Area) which prides itself on harboring one of the few remaining breeding populations of tigers in the country. Muongmuay *kumban* encompasses six villages: Donkeo, Paklao, Bouami, Muangmuay, Huaykon and Vangkham (Figure 1A). This village cluster has been selected based on its typical characteristics of upland agriculture in conversion with a relative remoteness from the main markets, hindering the diversification of agricultural activities. While subsisting with local production, traditional slash and burn agriculture prevails in these villages and most of the cash income is usually generated from the sale of non-timber forest products (NTFPs) and livestock.

Landscape change analysis based on remote sensing data showed a gradual segregation between agricultural and forest lands, the former concentrating along the road while the latter pertain to less accessible or protected areas (Castella et al., 2011). Historically, the landscape used to display a more complex mosaic, typical of swidden systems but the successive land policies resulted in a gradual simplification of the land-uses. Since the 1990s, pressure has been created on the agricultural land by relocating villages closer to roads in an attempt to increase villagers' access to market, education, water and electricity infrastructures, etc. Land scarcity was also exacerbated by decreasing the fallow period with the three-plots policy, i.e. during individual land allocation each household was restricted to three plots for rotational crops, de facto limiting the fallow period to three years maximum. During the same period, the boundaries of the national park were expanded which led to the relocation of villages present in the vicinity.

Recent changes in land-use are gradually leading to a segregated landscape structure with, on one hand, regenerating forest resources in strictly protected areas and, on the other hand, degraded landscapes dominated by intensive agricultural activities in the most accessible areas. Conservation and development areas have been spatially dissociated. While forest regeneration has obvious positive implications for biodiversity in protected areas, the reduction of complex landscape mosaics that used to retain a large share of the original forest biodiversity, is detrimental to the poor upland communities that relied on non-timber forest products as a safety net in periods of shortage. Opportunities to diversify agricultural activities exist, but improved fallow systems supposed to promote an ecological intensification of agriculture and avoid encroachment over forest land are usually proposed by pilot project in the absence of coherent land management plan which reduces the chances of adoption by individuals. Collective decision making, key to adoption is often bypassed and the lack of negotiation rarely allow for a village consensus. Moreover, land-use planning is considered as a key policy instrument to help reconciling conservation and development objectives and prevent loss of ecosystem services (i.e. biodiversity, soil fertility, carbon) in the complex landscape mosaics found in Lao PDR (MAF-NLMA, 2009).

4. Action-research in PLUP implementation

In 2010, an innovative approach to PLUP was designed so as to apply the principles of enhanced participation and integration described in Section 2 and tested in real conditions in the six villages of Muangmuay village cluster, in Vienkham District (Figure 1A). The action-research involved scientists from international (e.g. UQ, CIFOR, IRD) and national (e.g. NAFRI) research institutions, practitioners (e.g. development projects and extension agents from the District Agriculture and Forestry Office - DAFO), local authorities (e.g. land management officers and district governor office) and village communities. A dozen people took part in the implementation of PLUP over successive field missions. The end-goal was to

train a team of national experts, capable of applying the method by themselves. The overall approach presented below has been developed through an adaptive process that was constantly refined during implementation in villages.

Village boundary delineation

Generally, a combination of topographic maps and high resolution satellite imagery was used to define boundaries in one village at the time. Considering the objective to address boundary issues for a cluster of villages, the challenge has been to define a way to bring together knowledgeable village representatives from all the concerned villages and delineate initial boundaries in one day. For that purpose, a participatory 3D model (P3DM) was constructed for the whole village cluster, made of 4 blocks for a total extent of 180 by 180 centimeters (Figure 2C). Each block was built in one day by a team of four persons using paper board cut around the contour lines and superimposed (see Rambaldi, 2010). With Geographic Information System (GIS) software and only the village points layer available, a frame encompassing all the target villages was created and clipped with a Digital Elevation Model (DEM) of the area. Participatory maps of the villages were used to appreciate the potential extent of villages that did not possess definite administrative boundaries.

Representatives of the six villages of the *kumban* met around the blank relief model along with delegates of the National Protected Area and people from villages neighboring the target *kumban*. People started to familiarize with the 3D model by adding names of places, rivers and mountains in their own language (Lao or Khmu). Then they spontaneously started discussing with their neighbors about the location of the boundary between their respective villages. The delineation was done using colored pins and threads and facilitated by staff from the team speaking both languages. The delineation of the 6 villages' boundaries finished after three hours of intense discussions and negotiations. The polygons representing the village limits were geo-referenced and digitized in ArcGIS, and then projected on a wall to make hardcopy versions for each village.

The boundary delineation meeting involved only a couple of village representatives for each village. Consequently, in order to validate the boundaries, the maps were presented in each village to a broader assembly. The two representatives explained the collective process they had gone through and the boundary delineation was collectively refined and approved after discussions. The villagers and the implementing team also discussed the location of required GPS readings for the finalization of the sections of the village boundary that did not match any physical features, e.g. rivers, mountain ridges.

Finally, during a meeting with the village cluster representatives, the boundaries of all villages were reviewed and finalized using maps. Figure 1B displays the result of the delineation process validated by the local authority. After ensuring that no potential territorial conflicts were left pending, inter-village boundary agreements forms were issued to all villages and approved by the district administration.

Data collection and processing

Socio-economic surveys were undertaken at different scales in each village.

At the village level, a census provided general information about the village households on social aspects (e.g. ethnicity, position in the village, social status), financial assets and sources of income (e.g. capital, number of parcels, livestock and plantation). The village census was complemented by an assessment of past population trends that helped identifying potential village land requirements in future years. Men and women focus groups were organized

separately to identify agricultural and forest land related problems and opportunities that could be addressed by land management plans and village extension programs. Finally, basic information on village wildlife, as well as the location, relative abundance and collection patterns of wood and non-timber forest products were used to assist the land zoning activity.

At the household level, semi-structured interviews were conducted with 30 randomly selected families in the village to characterize the household economics and create categories according to a regional typology (Castella et al., 2011). In the questionnaire, cropping and livestock systems were investigated as well as collection of NTFPs. While of marginal importance to the majority of households in the study area, plantations of valuable industrial trees, i.e. teak, rubber, agar wood, and income from off-farm activities were also assessed as they usually indicate a high level of socioeconomic differentiation within the village. More systematic landscape level information was also gathered on the number, area and location of both cropped and fallowed agricultural plots in the village. The household and land-use data generated from different sources were subsequently crossed checked with villagers. This adaptive stepwise survey was used to gradually refine the PLUP knowledge base available at village level.

Further, an *analysis framework* was required to fully appreciate the value of all collected information. In general, most LUP teams collect a large range of data because it is a compulsory requirement from national guidelines, but then using only a limited subset of the available information. This does not suggest that implementers do not have at their disposal relevant methods to conduct land-use planning, but that they usually rely on their own field experience and empirically built mental model to facilitate the participatory planning activities. This person-specific approach, highly dependent on individual skills and personal facilitation qualities, tends to impede on the ability to replicate and consistency of planning methods across sites. As a result, the LUP processes become highly dependent on the acquaintance of individual implementers and projects. The extent to which socioeconomic data collected during the PLUP are actually used for land zoning and land-use planning becomes highly variable at the sub-national and national levels.

In the proposed analysis framework, the first step consisted of categorizing the households into several classes. Data on income generation were compiled, with each household being classified into different types of livelihood strategies depending on the share of their total income generated from cropping activities, livestock raising, tree plantation, NTFP collection or off-farm activities. Dependency matrices linked household types and income generating activities. The expert-based household typology was done according to classification criteria generated from intensive livelihoods survey in the northern uplands of Lao PDR (Table 1).

Land-use zoning

Setting up a Village Land Management Committee

In general, the important decisions made in the village are devolved to the village authority composed of the village head and two (or three) deputies, heads of elder committee, youth and women union and secretary of the communist party. However, as indicated in the PLUP manual, a better balance of power within the group involved in land-use planning should be promoted to improve broader village community participation. To address this concern, a village land management committee (VLMC) was set up with members selected according to individual criteria: high motivation, ability to communicate and knowledgeable of village land-uses. Furthermore, the selection procedure aimed at balancing gender, ethnicity and socioeconomic status of the VLMC members. Achieving gender balance often involved tough

negotiation with local authorities as they were almost systematically reluctant to provide enough women names, complaining that women do not usually make decision at village level, are too busy with domestic tasks and field activities, and are not knowledgeable enough on land issues. Despite long discussions, in most cases, the initial gender balance requirement ended up as a 2/3 men and 1/3 women proportion. A committee membership of 10 to 15 participants was found ideal to insure real interactions within the group and ensure that the different individuals can voice their concerns (Neef and Neubert, 2010).

Participatory landscape simulation

A role-playing game called 'PLUP Fiction', described in details by Bourgoin and Castella (2011), was used to train members of the VLMC in negotiating land zoning on a stylized landscape. Within a relatively short time of one and a half days, a group of villagers learned about the implications of land zoning on their livelihoods. This group building exercise was the cornerstone of an empowerment process, group building exercise that put members of the VLMC in the shoes of land-use planners. During the zoning simulation, people drew areas of different land-uses on a board made of 100 one-hectare cells. After delineating all the zones, players counted the number of cells of each land-use types to get the corresponding number of hectares. The values on economic and environmental returns to the different land-use types were then multiplied by the number of cells associated with each land-use to compute the economic and environmental values of the whole simulated landscape. Environmental value pertains to biodiversity and carbon indexes associated with the different land-use types. Incomes derived from livestock raising and NTFPs collection in the simulated landscape were also included in the calculations in addition to the agricultural income. The "landscape values" resulting from successive land zoning simulations helped participants to explore different options without consequences in reality. They could negotiate land-uses, adjust and readapt the plans until a consensus was found among the different stakeholder groups they represent (i.e. villagers, district authorities, conservationists). It constituted a sort of dry-run for the actual land zoning negotiations taking place the next day.

Village zoning

The land zoning process involved the village land management committee delineating zones on a 3D model of their village instead of the simulation board of "PLUP Fiction" role play. First, the participants familiarized with the blank terrain landscape. They wrote the names of places they recognized (i.e. mountain summits, rivers) in their own language. Then data collected during focus group discussions, i.e. NTFPs, wood and wildlife locations, was also displayed on the 3D model with stickers. When all features of the landscape had been apprehended, using needles and strings, the participants delineated land zones within their village boundary (Rambaldi, 2010). This adaptive method triggered lively discussions about the location and type of land-use without any external intervention (Figure 2). When the whole landscape had been dealt with and the zones were named and described in relation with physical features of the terrain, the zoning stopped. Pictures were taken from above so as to encompass the whole village landscape. Then, the landscape pictures were georeferenced with the help of recognizable terrain features such as mountains, roads and rivers, to capture the land-use plan into a GIS software (ArcGIS). When the image fitted an appropriate scale, the different land-use types were subsequently digitized as polygons. A script was run to calculate the exact area of each polygon.

Iterative planning

Time-wise

The parameters used to provide environmental and economic feedback from the land-use plan were the same as those elicited by the members of the VLMC during the 'PLUP Fiction' zoning simulation. They were complemented by socio-economic data from detailed household surveys to estimate the percentage of each household type in the target village and their relative dependence on the different land-use types. Based on the GIS-computed area for each land-use type, a cost-benefit assessment of the land-use plan was generated from an Excel spreadsheet and presented to the village land management committee. First, an overall environmental value for the landscape was provided as a combination between biodiversity and carbon indexes. The total village income then computed livestock, agriculture and NTFPs returns to land.

The economic outputs of a given landscape arrangement could thus be compared with the livelihood needs of the different household types and discussed by the village land management committee. Depending on the feedback received, members of the committee negotiated which kind of land-use should be added, removed or modified. They could enter into a new round of planning, i.e. delineation/capture/analysis. Time wise, the process was not costly. Photos were taken after each round of land-use planning and analyzed in the GIS. Then, given the dynamic structure capabilities, the model generated outputs instantly after computing land-use areas. This activity took one day in average. Like in the zoning simulation, the process stopped when a satisfactory compromise was found.

Scale-wise

The Government of Laos (GoL) has granted the newly created sub-districts units, i.e. village clusters or *kumban*, to be the scale at which land-use planning activities should take place. Once the village boundaries had been agreed upon at the village cluster level the land-use planning was conducted in the 6 villages of the Muongmuay village cluster successively. Figure 1C represents the final land-use map of the cluster as an aggregation of single village land-use plans. At the end of the process, a planning meeting was organized at the *kumban* level, gathering two key members of each village land management committee, one man and one woman, who were selected by their peers to represent their village. The overall objective of the meeting, chaired by the head of *kumban*, was to visualize the results of the land-use planning conducted for each village and propose to negotiate any changes planners wish to make on the 3D model at the higher level of integration (i.e. village cluster). For example, discussions took place on livestock areas that cut across village boundaries and are therefore prone to livestock circulation in neighboring villages. Some villages decided to build fences around their livestock areas while others reached agreements on inter-village livestock management (e.g. communal livestock zones). Corridors were also created for wildlife circulation by creating continuous tracks of conservation forests between contiguous villages. After the meeting, the various village and inter-village agreements were checked collectively and a village cluster agreement was prepared for signature by the District Governor.

5. Discussion: how does the proposed approach fit the PLUP principles

The approach presented in this paper combines a number of individual tools and methods that address the challenges of PLUP implementation in Lao PDR as described by Lestrelin et al. (2011a, 2011b). The whole framework as well as its individual components were designed through a participatory learning and action process, and gradually refined to overcome practical problems faced during implementation. Such learning process allowed to draw

lessons for out-scaling (i.e. replication in other places) and up-scaling, reported below in relation with the three principle of PLUP introduced in Section 2.

Participation: from meeting attendance to consultation and negotiation

As pointed out by Lestrelin et al. (2011b) participation is still too often considered by land-use planners as a question of who is present in the room during the land-use planning process. The extent to which people understand what is going on and the influence they could have on the process by voicing their ideas remain largely overlooked.

In many cases, improving participation as been interpreted as balancing genders and ethnic groups in the assembly or addressed by increasing the number of community members attending meetings. As a consequence, the qualitative dimension of participation (i.e. people engagement, commitment, and empowerment) has been neglected by land-use planners who focused more on the quantitative dimension of participation. One of the reason for suboptimal implementation is usually reported to be time constraints that prevent local communities from fully understanding the complex issues involved in land-use planning and consequently to actively engage in multi-stakeholders negotiations with district land-use planners. But we learnt from the innovative PLUP experience reported in this paper that important obstacles to genuine consultation of local communities are also (i) the absence of visualization and learning tools that would increase the understanding of local communities about the land issues at stake and promote effective participation, (ii) the limited facilitation skills of land-use planners to engage local people into an open negotiation process, and (iii) the absence of simple method to measure and monitor the quality of participation that do not motivate the land-use planners to do a better job in term of participation quality, i.e. engagement of local people, and therefore stick to monitoring simple indicator such as the number of people attending meetings.

Landscape visualization and learning tools have been developed to support land-use planning activities and help local people elaborate their own views based on a simple representation of the landscape. Firstly, a terrain model of the target village cluster was built based on a digital elevation model. The three dimensional representation of the landscape facilitated the interventions of the villagers who were not able to locate themselves on a simple 2D topographic map. The main advantage of Participatory 3D Modeling is that it allows participants to project their own mental model of the village land-use on a scaled physical landscape (Rambaldi and Callosa-Tarr, 2002). After the preliminary discovery phase where participants build a common representation of their environment by naming the important benchmarks of their village landscape (i.e. streams and rivers, valleys and mountains are labeled with their names in local language) they can exchange views and negotiate meaningfully on the basis of this boundary object they have co-constructed with the land-use planners (Brunckhorst et al., 2006, Maginnis et al., 2004, Sayer and Campbell, 2004). Secondly, a more abstract representation of the landscape was proposed during the 'PLUP Fiction' role play (Bourgoin and Castella, 2011) to focus the participants' attention on learning the rules of the game (i.e. socio-economic implications of decisions made on location and area of different land-use types) instead of being distracted by land issues of their real landscape that would be made visible by more realistic boundary objects such as high resolution satellite imagery. The landscape simulation board used to train participants to land zoning is therefore an abstract representation of the land cover/use of a hypothetical village. It triggered lively discussions about the general implications of spatial arrangements made during land zoning independently from the real situation of the village. This learning phase turned out to empower local participants who could mobilize the lesson learnt during the simulation to engage more actively into the planning process of their real village.

Getting a group of villagers, often illiterate or with primary school level, to engage into balanced negotiations with land-use planners is a real challenge. The 'PLUP Fiction' tool provides a unique experience for villagers to learn the tips and tricks of land-use planning (Bourgoin and Castella, 2011). It helps opening the black box of a seemingly complex planning approach by explaining how the environmental and socioeconomic value of different landscape patterns can be assessed based on local knowledge of different land-use systems. The tool provides clear linkages between village socio-economic information and the spatial arrangement of the land. As stated by Castella et al. (2005), individual farmers often have a limited understanding of the village land-use as a whole and a simulation involving playing different roles can increase the awareness of different local strategies in land management related to the household's dependence on the land for subsistence and income generation. Field observations showed that in the absence of training of the newly nominated members of the land management committee, past land-use plans mainly resulted from the inputs of government implementers and/or a couple of knowledgeable representatives of village authorities (Lestrelin et al, 2011b). Usually mere observers, villagers become main actors of the process through this training on land-use negotiations.

Integrating landscape planning and management

A more complex method had been tried out in a pilot study using GIS scripts and scenario modeling to compute all the values and deliver the outputs (Pullar and Lamb, 2008). Unfortunately, besides being more difficult to understand, it would have needed advanced GIS training for local government staff and the complexity of the scripts and programming activities would have prevented them to adapt and/or re-use the method in other villages. Other approaches relying exclusively on intensive use of high definition satellite imageries are constrained by the time and skills required from planners to make sure that local actors can actually understand and use these high-tech tools and maps. Without a proper training empowering members of the village land management committee, there is a risk that participants become passive spectators of the planning process, leaving the pilot sit to the district planners who master the technique. These experiences are reported here to stress the importance of adapting the materials and methods to the local contexts and to the capacity of the people who will be further implementing the land-use plan.

One key issue faced systematically when starting PLUP activities in a new village is trust building between the stakeholders that will interact during the few days of the planning process, i.e. the district planners (with the support of the action research team in our case) and the village community. At the debriefing session taking place after the end of the collective process, villagers usually admit that they were reluctant to provide real, precise information to the team collecting socio-economic data as they suspected that the information would be used for tax collection or to impose the three-plot policy. As a result, when asking villagers about their number of plots land-use planners got systematically the politically correct answer: three plots, which was later systematically contradicted once the team could get better insight in the village land-use system. The learning process increased the self-confidence of the participants who realized that using correct information about land-use and livelihood systems would improve the quality of the final product, i.e. the land-use plan, and therefore would facilitate its implementation (Bourgoin, 2011).

The first round of planning on the village terrain model systematically ended with a tense moment of doubt and then of revelation about the importance of local people contribution to the quality of the PLUP output. The experience repeated in the six target villages showed that villagers systematically represented their current land-use on the 3D model and the result was far from realistic in term of labor force required to implement such a plan. For example,

members of the land management committee of Muongmuay village allocated 2074 ha to agricultural land for rotational crops while they had declared 439 ha during individual household surveys, which is close to the three 1ha-plot policy when multiplied by the 177 village households (Bourgoin, 2011). This discrepancy between the individually declared areas and the mapped one for the same land-use type were used by the facilitators to reflect with villagers on the importance of reliable data. With the limited labor force available in the village it was impossible, under the current cropping practices, to exploit the large area delineated as agricultural land. Members of the land management committee then acknowledged that the number of plots declared by each households had been underestimated to escape taxes, that the plots were bigger in size than the one-hectare plots usually declared and the fallow period longer than the 'official' three years. Then they agreed to revise the initial household data to get figures closer to the reality, which allowed the group to engage into a more realistic second round of zoning. The data provided by the villagers about the extent of the different land-use types were crosschecked with a high resolution ALOS satellite image of the district dated 2009. The next rounds of zoning usually brought the group to decrease the land under rotational agriculture towards more permanent crops and plantations and larger forest areas (Bourgoin, 2011). As a result the plan gradually became more realistic in terms of labor force requirement and size of village livestock herd the planned land-use pattern could accommodate.

Having a realistic plan is indeed a necessary condition for its actual implementation. In villages investigated by Lestrelin et al. (2011b) where LU/LA had been implemented most recently, a reaction to negative impacts of the three-plots policies had been to allocate to the villagers whatever land they would request for agriculture, resulting in poorly realistic plans similar to those obtained during the first round of PLUP. In fact, the lack of enforcement and monitoring of the plans created a status quo and LUPLA only achieved to maintain the existing practices. Whatever land-use plan map was obtained as output of LUP/LA, either very restrictive on agricultural land under the three-plot policy or very lax with land required by villagers, the result was the same, and villagers would stick to their current practices and land management rules and rapidly forget about the process. Consequently, it was very difficult to retrieve documents or evidences of LUP/LA only a few years after its implementation. This was the case for example, in Paklao and Bouami villages of Muongmuay cluster where LUP/LA had been implemented in 2006 but nothing else than the wooden board with the land-use plan at the entrance of the village was remaining only four years after (Lestrelin et al., 2011b). In these villages, the land-use plan was never translated into action mainly because people had not cared about producing a realistic plan at the onset of the process.

6. Conclusions

This paper shows how visualization and learning tools can help translating participatory principles into reality by truly empowering the locals in designing future land-use plans and by acting as catalysts of negotiation. Our action-research approach attempts to move beyond the 'dos and don'ts' or 'PLUP recipes' to propose an integrative communication platform combining local and scientific knowledge. It exemplifies "how [science] can improve the quality of the decision making process, as well as that of it outcome" (Beunen and Opdam, 2011:325). The proposed boundary objects empower the village land management committees by improving effective participation. Indeed, participation is not de facto granted by organizing a workshop and putting people together in a meeting room. Often left in the past as mere observers of a planning process piloted by district authorities, the locals can voice their

views and carry some weight in the final decisions over land-use. Hence, by providing feedback on negotiated plans after a crucial learning session, participants were able to compromise a plan with a high degree of ownership.

Beyond mapping and collective definition of land management rules attached to each land-use type, extension activities have to be developed to translate spatial agreements and good intentions into concrete action. The lack of incentives to implement the plan has been pointed out as a major constraint to sustainable landscape management (Lestrelin et al., 2011a). Therefore, land management activities need to receive adequate support from development projects and/or payment incentives to keep the momentum after a land-use plan is negotiated and avoid a rapid return to "business as usual" once the LUP team has left the village as reported in many occasions.

Monitoring is therefore required to ensure the quality of the LUP process in terms of both short-term effectiveness and long-term impacts on landscapes and livelihoods. The monitoring of the PLUP process could take the form of a timely feedback on the level of participation (e.g. quality of the participants, capacity to communicate, power relations, level of understanding) that would allow implementers to adapt their facilitation methods and give more time and/or more opportunities to local people to express themselves (Lestrelin et al., 2011b). On the longer term, the effectiveness of the land-use plans should be appraised to assist decision-makers in adapting management plans and strategies to changing circumstances. Through the development and measurement of relevant landscape and livelihood indicators, a post-PLUP monitoring should assess the impacts of land-use planning and analyze the gaps between foreseen and actual outcomes of PLUP. Such long-term landscape monitoring should provide land-use planners with insights on the local successes and failures and help them adjust the plans to unpredictable events and also decide when the time has come to revisit the land-use plan.

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Table 1. Household types characteristics

Type	**Main income source**	**Criteria (***main* / secondary**)**
A	Shifting cultivation	- *No major income from plantations,* - *Receive less than 10-15 million kips/year with livestock (cattle + buffalos)* - Involve in off-farm work activities: waged worker, handicraft
B	Livestock	- *No major income from plantations,* - *Receive more than 10-15 million kips/year with livestock (cattle + buffalos)* - Involve in off-farm work activities: waged worker, handicraft
C	Plantations	- *Involve in plantations: teak, rubber, agar wood...* - Involved in livestock
D	Off-farm	- *Involve in off-farm activities: trader, shop* - Involved in livestock - Involved in plantations

Source: Comprehensive analysis of trajectories of changes in the uplands (CATCH-Up) regional research program, NAFRI-IRD-CIFOR, 2007-2011.

Figure 1. Location of the district of Viengkham (A) and the target villages where land-use planning was conducted from boundary delineation (B) to land-use zoning (C)

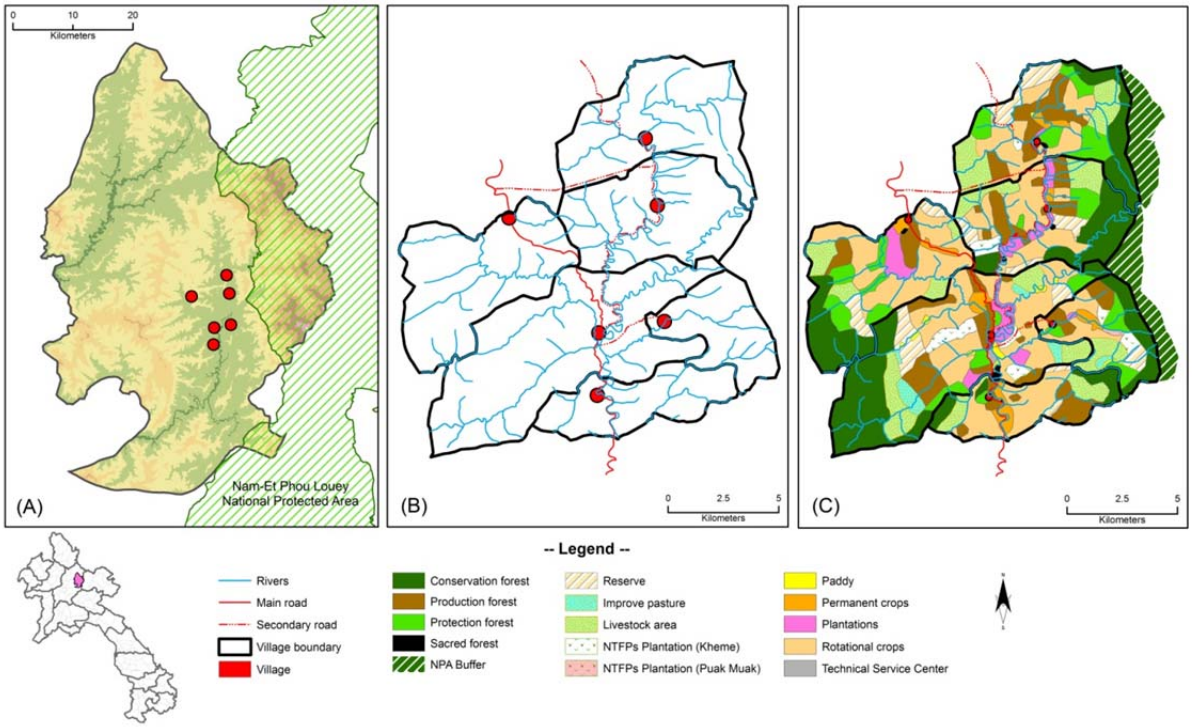

Figure 2. Boundary objects support interactions between people and landscapes – (A) virtual landscape used to simulate land-use planning, (B) 3D Modelling facilitates the comprehension and participation of villagers, (C) Resulting land-use zoning in Muongmuay *kumban* (see also figure 1C).