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Integrated natural resources management at meso-scale: a process oriented approach to craft operational strategies for adaptation and vulnerability reduction to global change

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**INTEGRATED NATURAL RESOURCES MANAGEMENT
AT MESO SCALE: A PROCESS ORIENTED APPROACH
TO CRAFT OPERATIONAL STRATEGIES FOR
ADAPTATION AND VULNERABILITY REDUCTION TO
GLOBAL CHANGE**

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INTEGRATED NATURAL RESOURCES MANAGEMENT AT MESO SCALE : A PROCESS ORIENTED APPROACH TO CRAFT OPERATIONAL STRATEGIES FOR ADAPTATION AND VULNERABILITY REDUCTION TO GLOBAL CHANGE

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ACRONYMS

BAU	Business as usual
CSO:	Civil Society Organization
CBO:	Community Based Organization
CGIAR:	Consultative Group On International Agricultural
CIRAD:	Centre De Coopération Internationale En Recherche Agronomique Pour Le Développement
CMAP:	Conceptual Mapping
COOPPLAN:	Cooperative Planning
CRDA	Commissariat Régional De Développement Agricole
CRP	Consortium Research Program
CS:	Case Study
CST:	Case Study Team
CTV	Cellule Territoriale De Vulgarisation
DEMAX:	Design Matrix
DST:	Decision Support Tool
DWG:	District Working Group
ECOSAUT:	Economic Social And Environmental Evaluation Of Land Use
EMF:	Environmental Management Framework
ENCORE:	A Theoretical Framework For Monitoring And Evaluation Of Participatory Settings
ES:	Ecosystem Services
ESM	Ecosystem Services Mapping
EU	European Union
FAO:	Food And Agriculture Organization
FAO:	Food And Agriculture Organization
GIS:	Geographical Information Systems
IA:	Impact Assessment
ICRAF:	World Agroforestry Centre
IDP:	Integrated Development Plan
IEA:	Integrated Environmental Assessment
IFAD:	International Fund For Agriculture Development
ILRI:	International Livestock Research Institute
IND:	Inner Niger Delta
INRM:	Integrated Natural Resource Management
INVEST:	Integrated Valuation Of Environmental Services
IP:	Innovation Platforms
IRA:	Institut Des Régions Arides
IRSTEA:	Institut National De Recherche En Sciences Et Technologies Pour L'environnement Et L'agriculture
IWMI	International Water Management Institute
IWRM:	Integrated Water Resources Management
JUST A GRID:	A Tool For Eliciting And Choosing Principles For Shared Resources' Allocation



LULC:	Land Use And Land Cover
M&E:	Monitoring And Evaluation
MA:	Millennium Assessment (UN)
MEA	Millennium Ecosystem Assessment (UN)
NBDC	Nile Basin Development Challenge
NGO:	Non-Governmental Organization
NR:	Natural Resources
NRM:	Natural Resource Management
OF:	Operational Framework
OPIDIN:	Outil De Prédiction Des Inondations Dans La Delta Intérieur Du Niger
OSS:	Observatoire Du Sahara Et Du Sahel
OZW:	Oum Zessar Watershed
PALA:	Participatory Landscape Analysis
PAPOLD:	Participatory Analysis Of Poverty, Livelihoods And Environment Dynamics
PIK:	Potsdam Institute For Climate Impact Research
PPD DIN:	Strategic Development Plan For Inner Niger Delta
REC:	Regional Economic Communities
RPG:	Role Playing Game
RRDF:	Rwenzori Regional Development Framework
SEA:	Strategic Environmental Assessment
SH:	Stakeholder
SLM:	Sustainable Land And Water Management
SWAT:	A Soil Water Assessment Tool
SWC:	Soil And Water Conservation
SWIM:	Soil And Water Integrated Model
TOR:	Terms Of Reference
TWG:	Thematic Working Group
UMR-GEAU	Joint Research Unit Management Actors & Uses
WAG:	Wat-A-Game Role Playing Game Toolkit
WEAP:	Water Evaluation And Planning System
WHS:	World Heritage Site
WI:	Wetlands International
WMP:	Web Mapping Service
WOCAT :	World Overview Of Conservation Approaches And Technologies
WP:	Work Package
WH	Stakeholders Workshop

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1 **Introductory section**

1.1 **Participation and development**

Several types of arguments have been advocated since the 1990s to promote participation of stakeholders, and more specifically of local communities, in environmental management and development projects.

The first argument results from the acknowledgement of the Western development sector that a multitude of development projects in the 1950-80s were not delivering sufficient successes. Often such development projects failed as a result of projecting western notions of the problems into the developing areas and promoting mostly technical solutions (Gleitsmann *et al.* 2007) based on western engineering optimism. Participation of the local stakeholders improved the effectiveness of such projects as they became more demand-driven, addressing the real issues and needs at stake and the possibility to factor in local contexts such that solutions to the issues were more fit and sustainable. Participation changed from an informative process, to at least a consultative process to, in some cases, co-development of solutions.

In the early days of participatory processes in development work, a second reason used to promote participation of beneficiaries was the objective of cost-efficiency. Implementation of solutions to environmental issues may require infrastructural developments and or land-use changes. The foreseen beneficiaries of the development projects were asked to provide in-kind labour to make such necessary changes (often in the form of food-for-work processes). Today, in the African context where decentralisation processes have devolved the mandate and responsibility of natural resources management to lower-scale governmental entities the cost-efficiency argument is still valid. In many cases, local governments are short of resources to implement interventions and depend on the assistance of local communities

A third argument for community participation in environmental management is that it is creating a sense of ownership and facilitating future implementation of policies and interventions. Using this argument in a constructive sense builds on the assumption that inclusive participation of many stakeholders leads to consensus-based solutions. Such consensus is especially important to reduce conflicts over the use and management of scarce natural resources (Dungumaro and Madulu 2003). Such ownership building processes may also increase the acceptance of environmental management solutions that require behavioural changes and investments at grass root level, as in the case of addressing over-exploitation of natural resources and/or environmentally adverse effects of local land and livelihood practices. In a negativist sense, cynics warn for so-called manipulative participation where participatory processes are used as a Trojan horse (Blaikie 2006) to get non-popular top-down decisions accepted.

As opposed to the above-mentioned arguments for participation that are merely instrumentalist approaches to improve environmental management, the fourth reason for participation pertains to a more therapeutic approach to participation. It acknowledges that, in many developing countries, communities lack capacities to deal with complex issues such as environmental management and hence that this capacity needs to be built further. Letting communities intensively interact in development projects on environmental management improvements provides "on the job" learning. It also gives communities opportunities to build networks

and social capital such that in future they are able to solve the issues with less assistance from external solution providers (Von Korff *et al.* 2012)

The final reason advocated for participation in environmental management has a more ideological character and is based on various (often Western) beliefs on how societies should and could function. The ideology starts with the enduring academic discourse on the pros and cons of community-based management of natural resources versus top-down normative approaches and /or market solutions (as for example in the works of Elinor Ostrom). The ideological reasoning is also backed by rights-based approaches to natural resources management which contribute to the development of water and other natural resources ownership and usufruct rights to grass-root stakeholders. Then there is an increasing (academic) discourse on the need for so-called good environmental governance. In this latter paradigm it is believed that only inclusive decision-making and full institutional interactions lead to equitable and sustainable growth and societies. Such interaction occurs both laterally (across economic sectors, from government to civil society to the corporate sector) and vertically (from central government to the grass-root electorate). Proponents of environmental governance basically promote a more participatory democracy. In their eyes participatory interventions are meant to level the decision-making playing field by building political capital in the civil society.

After a several decades of including participatory processes in environmental management in developing countries a number of often experienced constraints have been listed (Lane and McDonald 2005). They refer to issues of (1) power and equity notably:

- The myth of a "community" which is often not a homogenous nor harmonious entity and not necessarily the human construct providing most of the social cohesion;
- The myth of equity and representative participation at local level and hence the risks of consulting, co-developing, co-deciding or even supporting only the needs and ideas of an exclusive grass-root elite;

(2) to issues and perception over knowledge sharing and management

- The limited intellectual capacity available in communities to understand complex concepts to explain environmental issues and to develop optimal solutions for such issues, and the limited organisational capacity to manage and coordinate complex processes;
- The mismatch between indigenous knowledge and traditional environmental management systems (which are still often based on a context where environmental pressures were less acute) and the scale and extent of current environmental issues;

(3) to issues and perceptions over the "right scale" of management and governance

- The mismatch between the administrative scales where participatory processes try to develop management solutions and the scale of ecological systems' functioning;
- The tendency of local stakeholders to so-called parochialism where expenditure and other decisions are made to the benefit of local interests that are not necessarily in the national or public interest, or where local pressure groups oppose decisions they perceive as undesirable but which are possibly in the national or public interest;

- The limited capacity in governmental agencies and or civil society organisations (CSO) to develop and coordinate participatory processes with all its complexities, sensitivities and to develop the necessary resources to accomplish the logistics of such processes (Reed 2008).

To overcome this limits associated with a utilitarian perspective over participation we propose to explore participation in natural resources management in the framework of social-ecological systems which emphasizes the relationships between nature and society.

1.2 Integrating natural resources management in the framework of social-ecological systems

The rationalist perspective that has long sustain decision making in NRM was grounded in the paradigms of rational choice actors, standard equilibrium approximation, linear dynamics and changes, homogeneity and the existence of preferential level for resolution of issues at the intersection of certain spatial and temporal scales (Rotmans 2006).

Knowledge on ecosystems has progressively been conceptualized within the framework of complex systems: Many studies underlines their multi-dimensionality (biotic versus abiotic, bio-diversity, soil water content), their inherent diversity in term of matters and energy flows, the variability of stressors, the continuous changes under non-linear processes, the multiple equilibrium perspective as well as their emergence properties (Allen and Starr 1982). The emergence concept is based on the acknowledgement that, a system at a macro-level is not the simple aggregation of what happens at micro level: it possesses particular properties that cannot be reduced to, or exist outside of, the elements that make up the system at the micro-level. This complex functioning results in ambiguous cause-effect relationships, which questions the use of rationalist and reductionist perspective to solve natural resources management problem (Bellamy *et al.*; 1999).

More recent studies have furthermore underlined the relationships between the social sphere and the ecosystem crafting the concept of social-ecological systems (Folke 2000). This concept states that the environment and society are intimately related and do not evolve independently from one another. In other words environment dynamics induces social changes (i.e. the institutional, social, economic and political dimensions of the system) that translate into environmental evolution **under co-adaptation or co-evolution processes**. This concept also draws the attention towards the impact pathway dependencies (defined below) and the diversity of actors and sectors involved in the use and management of ecosystems and consequently the multiple perspectives on the ecosystems and management impacts (Foxon *et al.* 2008 ; Faber and Alkemade 2011).

This shift to complex system perspective has various methodological consequences for natural resources management approaches:

It demands that the multiple perspectives on the system (different users as well as the multiple scales) are explicitly taken into account. Participatory and/or multi-stakeholders approaches in this perspective have not an utilitarian value but derive from the relationships between nature and society. In turn, the development of participatory approaches has led to explicitly acknowledge the matters of power, politics and conflicts as underlined above (Hertin *et al.* 2007; Adelle and Weiland 2012; Bohensky and Lynam 2005).

Changes (either in the social world or the environment) are difficult to anticipate and their impacts difficult to assess. This means that uncertainties must be acknowledged as an inherent part of system functioning, which can only marginally be dealt with. While risks are hazardous events whose probability of occurrence can be calculated, uncertain events cannot be properly characterized. They are also of different nature: they can be related to the imperfection of the observation methods (or statistical uncertainties), of the existence of events that cannot be assessed in term of probability but that can be specified in term of sets of outcomes ("scenarios uncertainties") or acknowledged ignorance (Dessai and Sluijs 2007). In this latter type are included reflexive uncertainties which result from the human iterative agency and reflexivity that is human adaptation capacity. These uncertainties question the possibility and usefulness of prediction in social systems where qualitative and emergence processes resulting from human decision are the norm.

It also calls for **adaptive management** that is management based on experimentation and learning, which facilitates the adaptation evolving context. In complex systems, adaptive management gives importance to collective and iterative learning, especially approaches grounded on experimentation as a way of testing hypotheses about the functioning of the system or testing actors and ecological systems responses to innovative practices (Walters and Holling 1990);

Pathways dependencies refer to the fact that the impact of an innovation or a project and possible following interventions depends on their development and implementation process: The implementation process transforms the social and environmental system and consequently directly impacts the outcomes. Therefore projects or interventions cannot be considered independently of the political and technical practices mobilized for their implementation.

1.3 What functions for meso-scale institutions for INRM?

1.3.1 The significance of meso-scale in natural resources management

1.3.1.1 When scale is a political and social construct: the 'politics of scale'

Social scientists have underlined how the power relations between institutions and the mechanisms of domination, resistance and cooperation contribute to the definition of scales: it participates for example in the choices and reconfiguration of the division used to define scale (for example village / district / province). Hence the "politics of scales" or the choice of scale in political decisions and governance structures is an inclusionary or exclusionary instrument of power which modifies the means of access to resources and decisions (Swyngedouw 2004; Lebel *et al.* 2006).

The “Politics of scales” also underline that **scales and levels are not ontologically given**: They are social and political constructs (Adger *et al.* 2005; Ghose 2007), constantly evolving (Brown and Purcell 2005; Ghose 2007). Scale is the result and outcome of social struggle for power and control, a site of competition or negotiation and strategic alliance building. For example, while at municipal level or national level Brazilian landless farmers and large landholders severely compete with one another, at the local level of reservoir management these actors are joining their voice to contest water allocation to downstream users (Taddei 2005).

Thus actors make sense or use of scale to advance their specific agenda: the way an environmental issue is being framed can be relevant at one scale and not at another one or for one specific agenda. For example climate change can be framed as a local issue (and thus under local responsibility) or a global one (and thus a global responsibility) and these conceptualizations have significant impact on the orientation of negotiations (Termeer and Dewulf 2010). Failing to account for these differences may lead to unstable agreements as underlined in peri-urban water conflict management (Ducrot *et al.* 2008).

The ‘politics of scale’ is both material and discursive (Ghose 2007) with struggles to control over tangible space and resources as well as using ‘scaled’ argument as a strategy for gaining influence. For example local activists can use the global environmental discourse to legitimize their point of view and gain legitimacy beyond the local level. Different tools can be used in this struggle such as narratives (crisis narrative for example) around which actors may form alliance, deliberating and constraining participation (through the definition of agenda, of participants) or technologies such as GIS (Lebel *et al.* 2006).

Acknowledging the “politics of scale” necessarily leads us to question the significance to stress a given level for developing INRM process which is in our case the meso-scale level. This entails to examine how spatial dimension is being mobilized in the analysis of the relationships between ecosystems and society.

1.3.1.2 Scale in natural resources management and governance

The relationships between ecosystems and society can be studied through different dimensional lenses. Each of them carries its specific assumptions concerning the socio-spatial relationships and its analytical or methodological biases. **Landscape** for example points out to the shaping of ecosystems by social practices (Emerson *et al.* 2009) and tends to emphasize the different dimensions of ecosystems (such as biotic-abiotic, bio-diversity, soil water content, etc) and social systems (including aesthetic, cultural, economic and infrastructure dimensions) (Görg 2007). A clear hierarchical socio-spatial division is embedded in the concept of **scale** while the concept of **territory** emphasizes the divides (focusing between the difference between the outside and the inside) and holds a functionalist perspective (of resources use or jurisdiction of practices) (Jessop *et al.* 2008).

Indeed, governance of natural resources which can be defined by “*the structures and processes by which society share power, shape individual and collective actions*” (Young 1995) has always had a strong territorial component. But contrary to the idea of a set of descending, interlocked regulatory arenas

dividing society from top to bottom that is generally referred to (Cash *et al.* 2006), society's collective modes of action mobilize different forms of interaction such as hierarchy, networks or associations which goes beyond vertical interactions. Beside the much used concepts of territory and scale, Jessop *et al.* (2008) identifies two different dimensions related to "social space" which can be used to analyse the relationships between ecosystems and society: the notions of place and network. The notion of place emphasizes the idea of proximity of discrete entities while network the notions of flows and motilities in a horizontal (power-void) dimension. As each analytical lens bears specific bias, Jessop (2008) recommend avoiding "one-dimensionalism" i.e giving preference to only one of these dimensions. Indeed these analytical lenses are associated with different perspective over natural resources governance.

It is now well acknowledged that the traditional mono-centric centralized governance model embedded in the notion territorial (catchment for example) or functional (energy ministry governing water governance to ensure hydroelectricity provision) jurisdiction is not necessarily the best approach to ensure fair allocation and supply and avoid the destruction of natural resources (Lebel *et al.* 2006). Other modes of coordination aiming at solving the problem of bounded rationality by facilitating the exchange of information have been advocated. This includes market coordination or coordination through negotiations and mutual understanding (Jessop 2002). This attention to other form of coordination highlights the role of multiple stakeholders groups with their different interests in the regulation process of NRM as well as the necessity to mobilize other mechanisms the traditional command-and-control regulations.

More recent analysis focus of a network perspective of governance: It often results from the relationships between multiple authorities with overlapping jurisdictions which gave way to the 'polycentric governance model' (Anderson and Orstrom 2008; Andersson and Ostrom 2008); The framework of multi-level governance (Termeer and Dewulf 2010a) underlines other types of interactions: global actors (epistemic communities, donors, international organizations for example) often have a (strong) influence over national and local actors; The role of regional and local state agencies is often strengthened while cities and urban regions are no longer sub-units of national states (e.g. submitted to "spatial" hierarchy); Public entities and firms with private interests who operates at diverse jurisdictional levels often collaborate in shifting arrangement to manage natural resources. For their parts the adaptive management scholars underlines the dynamics aspects of NRM governance which evolve as a results of interactions between resources and social systems and/or occurrence of unpredictable events and the subsequent role of network and knowledge management in NRM.

All these works highlight the altered role of state and government in governance: NR governance is now understood as the results of the administration and/or co-ordination between various actors with generally overlapping jurisdiction which mobilizes of a diversity of mechanisms such market procedures, hierarchical command-and-control tools as well as dialogues and information exchanges or knowledge management dynamics. The combination of these coordination processes and power relationships (i.e. confrontation, cooperation and domination) results in an evolving institutions (e.g. decision arenas, reference territories) and subdivisions (Swyngedouw 2004; Young 2006).

Such a conceptualization of resources governance based on **fluid cross-scale interactions** raises therefore the question of how to integrate social, socio-

economic and ecosystem dynamics into a coherent framework for effective decision making process.

1.3.1.3 What solutions for better natural resources management and governance in a 'scaled' world?

We have previously underlined that NR governance cannot anymore be considered as resulting from the unique managerial commitment of a given institution and that different perspectives can be used to account for the interactions that shapes decision making processes in NRM. These perspectives bear their own assumptions on the normative evolution of natural resources management (Jessop, 2008).

In a mono-centric governance, solutions to governance failure are influenced by the belief that structural changes with clarification of responsibilities can improve government capacity. It tends to focus on the issue of overlapping jurisdictions, the arguments of economy of scale and bureaucratic problems and discarding cross level interaction and consequently to the search of an ideal scale of intervention for the resources agency with improved juridico-political institution and knowledge and political practices. This strategy has often supported decentralization policies justified by the subsidiarity principle.

Coordination-based governance models emphasize less the clarification of responsibilities of institutions than the **accountability** and the **high transaction costs** associated with interaction mechanisms.

Coordination costs can be limited by constraining the number of jurisdiction levels, designing coordination procedures and forcing a hierarchical framework across them. On the other hand a network perspective, while providing the flexibility necessary to deal with uncertainties and a changing context, raises issues of effectiveness and concerns regarding the dispersion of government authority, lack of transparency and democratic legitimacy.

Accountability increases the legitimacy of governance, which is related to two main mechanisms: power and authority on one hand and the system of representation on the other hand. In democratic regimes, legitimacy is related to the democratic mode of representation – associated to the status of citizenship - and to state authority; but an enlargement of governance to a diversity of stakeholders raises the issue of participation whose limits has previously been underlined. Indeed the enlargement of stakeholders in NR governance system is most of the time founded on an *'ill-defined and diffuse notion of representation what is called "holder's status" (Saretzki 2002; Swyngedouw et al. 2002)*; Holders' status refers to participation procedure based on various forms of legitimacy and powers for example the acknowledgement of specific competencies (knowledge, skills) or leadership capacity. Because holder's status is often ill-defined and/or defined by organizer of the process, the legitimacy of participants selected on the basis of their holder's status can be contested in the participatory arena and the constituency. Besides, mechanisms to establish accountability either in political or legal terms are also often lacking (it is often simply assumed that representatives are accountable to the group they represent) which can also participate to a dilution of responsibilities Swyngedouw *et al.* (2002). Moreover, inclusion or exclusion, including in participative bodies, is by definition a tool of power and power relationships shape participation: some

groups (a typical example are migrants group) are systematically absent from participative bodies.

Swyngedouw *et al.* (2002) more specifically identify 3 main types of tensions in holders representation system: (a) between enhanced democratization of participation / non -democratic forms of technocracy through the sole inclusion of experts; (b) between holder participation partially realized, but a consolidation of power-based arena (non-state); and (c) improved transparency / accountability of the hierarchical layered system versus procedural legitimacy of network governance.

For its part the solutions proposed in an adaptive management perspective, are often based on remodelling social scale by changing existing institutions, and/or creating better links between levels. These links can be co-management procedures, epistemic communities, policy networks, boundary organizations and institutional interplays (Cash *et al.* 2006).

Thus NRM activities referring to a certain level or scale of intervention has the risk to be biased toward certain type of solution. And reciprocally some solutions may be more adapted to certain of types of governance systems and/or decision making processes. But studies have underlined that whatever the institutional innovation proposed to improve governance (such as structural reform, clarification of responsibility, new coordination procedure), effectiveness remains strongly related to the reform implementation pathway. Notably change management theory analysing the dynamics of organizational changes has revealed that the process of change itself is the most significant factor in explaining the success or failure of reforms (Termeer and Dewulf 2010). This stresses the importance of the quality of the reform process.

1.3.2 *Information, knowledge and tools in a scaled world*

As underlined by Jessop (2002), coordination in a complex and turbulent environment supposes heavy cognitive demand to counter bounded rationality and opportunistic behaviour. But as governance perspective orient toward specific solutions, they rely on specific assumptions concerning knowledge and information management.

Mono-centric governance model emphasizes the need for centralized knowledge and accurate anticipation mechanisms (prediction). It often points out information gaps. In market governance, the prime mechanism for information lies in the prices. Network governance model assumes that debate and discussion among actors facilitate the capture and sharing of distributed experience and consequently adaptation (Emerson *et al.* 2009). It emphasizes the role of social learning process to understand complex and non-linear dynamics and cross scale / level linkages as well as the importance of building trust to allow for more centralized collective action necessary to adaptation.

Understanding and comprehension of scales varies across scientific disciplines: while natural scientists have operated with relatively well defined hierarchical system of analysis, social scientists have mostly underlined the social and political construction of scales on one hand, and worked with less precise, more variable and fluid scales (Gibson *et al.* 2000). Economists for their part have paid more attention to temporal scale than spatial scale (Veldkamp *et al.* 2011). Besides, representations of the dimensions relevant to address society-nature relations vary according to stakeholders and are affected by their modes of comprehension and political, economic and scientific simplifications (Meadowcroft 2002; Sneddon 2002; Bulkeley 2005). The legitimacy, credibility and means of

integrating and understanding knowledge are thus strongly dependent on the associated stakeholders and consequently on the "level" at which the knowledge is understood to be produced and analysed.

Very generally speaking, generic knowledge produced by formal scientific procedures is often favoured at policy-making levels while local actors are expected to mobilize knowledge more related to their own practices or situation experience either based on traditional knowledge or sometimes scientific procedures (Weible *et al.* 2004; Cash *et al.* 2006; Young 2006). In this perspective situational and traditional knowledge are seen as local in scope of relevance and power, whereas the rules and knowledge of the state are often understood as much bigger in scope and significance. This is sometimes used by upper levels to mobilize processes of cognitive hegemony and impose certain models, types of management or strategic orientations (Taddei 2005; Molle 2008).

The technocratic knowledge embedded in many tools is often exploited in participative arenas at the cost of democratic participation and empowerment of civil society (Swyngedouw *et al.* 2002; Molle 2008). For example the liberal model of democracy tends to claim that the prerogative of private decision-makers and elite expert networks should be accepted by ordinary citizens. The systematic use of technical language and the type of participation supported by occidental cultural frameworks promote formal education and capacity of intervention in the public space (Roncoli 2006), which favours participants that have control of this kind of language; it often allows technicians to keep control of participatory arena related to water allocation in the North-eastern Brazil for example (Taddei, 2005).

Thus, the kind of knowledge which is being mobilized, the way the information is being collected, the way it is being handled, all depend on the relationships between actors and shape their relationships. For example in the peri-urban areas of Latin America, policy-making actors were unable to learn about the communities' perception and information integrated in a simulation tool when community representatives were not in the position to voice their perception and concerns. In participatory settings using this simulation tool where no communities' actors were present, policy level actors focused their concerns on aspects that only made sense at their level and did not use elements of the tool directly referring to communities' concerns (Ducrot 2009).

Thus, making information available to stakeholders is not enough to have it processed and used by them. Scale affects the way issues are being framed and how information is being processed: It frames the type of questions that are being addressed; structures their resolution mode and the type of learning and information transfer between multiple actors.

This is why, in certain conditions, even top-down activities led by professional planners could be valuable for marginalized communities notably by helping them to create closer links with other actors (Ghose 2007). Capacity building and empowerment of marginalized actors should not only help stakeholders to make sense of questions raised, but also develop their capacity to create ties and alliances with stakeholders operating at, or mobilizing, different dimensions and levels (Bulkeley 2005; Boelens 2008).

Information flows through the prevailing coordination mechanisms but the meaning and production of information depends on the mechanisms mobilized and the power plays to use them. Boundary-spanning tools refers to tools that facilitates the management and sharing of knowledge across boundaries and

enhance interaction and learning across social groups (Vinck 1999). They have a double function. Their substantive content facilitates the exchange of information, the explication and comparison of perceptions, and help to create mutual understanding, new collective knowledge, and practical solutions (Carlile 2002). But they also have a relational function and facilitate dialogue and the negotiation of meaning amongst actors. Both functions occur at different stages of their development and use (Fox 2000). These double functions suppose that they are mastered by the different types of actors. Low literacy actors can interact on technological tools provided there is no black box effect (i.e. they completely understand the content and functioning of the tools) (Barnaud *et al.* 2010; d'Aquino and Bah 2014), which may require preliminary work with simple and non-technological tools. In particular these authors have successfully used non computerized role playing game to overcome this technological constraints.

1.3.3 Conclusion: the functions of meso-scale institutions

The conceptual representation of governance argues for two different types of meso-scale institutions: (1) decentralized (or de-concentrated) state institution(s) established at a certain territorial level to fit the "right" decision scale on one hand and sometimes to facilitate a larger contribution of non-state stakeholders into governance ; this perspective focuses on the decentralized institution itself and the territory - and related ecosystem(s) on which it has a mandate; (2) the coordination between different institutions and organizations with different jurisdictional or functional mandates. This latter form of governance deals with flexible territorial levels and related ecosystem(s).

Decentralization has often been advocated by the necessity to enforce the subsidiarity principle, to empower local actors and give better legitimacy to decision making. But in practice it has often been associated with neoliberal policy reforms aiming at reducing state spending and the transfer of responsibilities power has not been necessarily accompanied by a transfer of resources and capacity (Eakin and Lemos 2006). Neither has the development of new capacities for the state, such as negotiation and mediation capacity, sharing power and political leadership with less resource, been undertaken. In such a context, efficiency of decentralized governance institutions is often compromised. Moreover even when the jurisdiction boundaries of the new administrative level has been defined so as to fit the ecosystem scale, such as, for example, the establishment of basin institution to manage water at watershed level, this decentralized administration often lack the mandate to address specific issues which are key drivers of ecosystems degradation: for example watershed institutions rarely have a mandate over land management while land use is a key determinant of pollution and change in hydrological regime.

Access to and use of natural resources is often related to infrastructure development and organization of output and input markets (for agriculture, biodiversity product, tourism, etc.). Indeed natural resources management cannot be disconnected from livelihood and economic development. Without the development of sustainable livelihoods and economic interests, there is no purpose for integrated natural management which by essence should ensure fair allocation of natural resources for human uses in order to avoid their destruction.

This means that integrated natural resources management intrinsically supposes the coordination between different institutions as it is unlikely that one agency

could be in charge at the same time of the management of a variety of resources as well as of local development. At best, these issues can be integrated through territorial planning but implementation would require the mobilization of different institutions and organizations. Given the diversity of interests and stakes engaged, trade-offs, that is political choices, are to be expected and adequate process for these political choices must be put into place. Yet, because social-ecological systems are complex systems, emergence processes in the social or ecological fields are expected to occur and to be visible at different levels. There is consequently not one right level for territorial planning but the need to consider different levels at the same time as well as the interactions between these levels. These interactions can take different forms: flows of energy and matters in the ecological dimension, hierarchical control over institutions, market mechanisms, networking or dialogue settings in the social dimension.

Consequently meso-scale can be understood at an intermediary level between national level and local level combining decentralized state organizations, different types of organizations and actors organized in a network of institutions with interests around natural resources management in a given ecosystem, sufficiently broad to account for a large part of possible emergence processes. In a monocentric and multi-level perspective this can be viewed as the place where national policies can be downscaled and successful interventions at local level disseminated. In a polycentric governance perspective, meso-scale is a place where activities can be coordinated to foster positive interactions or leverages and avoid incoherence. It is also the place where the different perspectives are being confronted and the necessary trade-offs being made.

The Afromaison project is using the planning process to foster integration of the different dimensions and institutions and aims to develop and test an approach for planning INRM with focus on the meso scale. Our theoretical analysis have pointed out to the need to consider not only meso-scale institutions when they exists but also other institutions and actors intervening at other scale (local or national); to account for different types of interactions existing between them ; to take care about the process permitting their mobilization and interactions as well as knowledge sharing or information transformation.

The framing of the issues to be dealt with, and the way they will be dealt with, result from the sharing and confrontation of the perceptions of these multiples actors. As scale frames issues, solutions and information transfer, an adapted approach must be put in place so that the sharing of perspectives and/or knowledge do not result in the "imposition" of the most powerful actors' perspectives under cover of false consensus building. This means that spaces of true debate should be opened if significant differences are identified instead of looking for consensus at all costs. Adapted boundaries-spanning tools may have a role in helping actors to make sense of the information and knowledge exchanged and in creating and reinforcing links between actors.

2 Planning in complex system: the operational framework of Afromaison

2.1 Planning in natural resources management: towards participatory and adaptive approaches

Planning is viewed as the process by which different components of natural resources management can be effectively integrated and the necessary trade-offs made. It has always been a fundamental function of management and lied at the centre of natural resources management. For long, the notion of planning was a very rigid one. Planning consisted in deciding the goal, objectives and actions when, or even before, activities started. It thus included defining the goal to achieve, defining and evaluating alternatives routes and deciding a final course of action. In 1994, Mintzberg defined planning as "*a formalized procedure to produce an articulated result, in the form of an integrated system of decisions*" (Mintzberg 1994).

However, a conceptualization of natural resources management in the framework of complex systems questioned this "ballistic" conception of planning, according to which a plan or a strategy is a trajectory to reach a certain target (Avenier 1997).

New forms of planning had thus to be developed. A first change was to focus on integration with the development of integrated planning for NR, where integration can be understood at various levels: in terms of natural resources (a plan should not focus only on water for instance but also integrate other interdependent resources), dimensions (such as technical, legal, managerial, etc.) or scales (local, meso, national, regional / international (Biswas 2012; Froebrich 2012; Hassenforder and Noury 2012; Lee 1993; Pahl-Wostl *et al.* 2008; Pegram *et al.* 2013).

A more "*adaptive*" concept of planning was also considered (Folke *et al.* 2005; Holling 1978)(Folke, Hahn, Olsson, & Norberg, 2005; Holling, 1978; Kato & Ahern, 2008; Lankford, 2008; Lee, 1993; Pahl-Wostl *et al.*, 2005; Plummer & Armitage, 2010; Rutledge & Lepczyk, 2002), which is often called "*strategic planning*". According to Simon, the task of strategic planning is to assure a stream of new ideas that will allow the organization to continue to adapt to its uncertain outside world (Simon 1993). Strategy is the art of using information arising during action, integrate it and quickly formulate action schemes (Avenier 1997; Morin 1990). These notions of planning imply being open to potential endogenous and exogenous changes in the environment and adapting to them. Still, one needs to define the vision, indicators and outputs to be produced but planners should be aware that these might need to be reviewed and amended when conditions or knowledge change.

As the acknowledgement of multiple perspectives on a complex system have increased, most planning practitioners have also argued that in order to be integrative and adaptive, such planning processes should include the relevant beneficiary or targeted populations. Various authors have addressed this issue,

through various arguments and trends: *collaborative planning* (Connick and Innes 2001; Healey 2003; Innes and Booher 2000; Ridder *et al.* 2005), *communicative planning* (Forester 1989; Healey 1996; Hoch 1994; Innes 1998; McGuirk 2001; Forester 1999), *participatory planning* (Allain 2002; Forester 1999; Smith 1973; UN Habitat 2001; Von Korff *et al.* 2012) and planning through consensus building (Innes 1996; Susskind *et al.* 1999). In such cases, participation does not only concern the central government but, depending on the relevance of their inclusion, also lower levels of government (line ministries, municipal administrations, etc.); possible transboundary bodies (donor agencies, Regional Economic Communities - RECs, other River and Lake Basin Organizations, etc.); local bodies and agents (farmers, water users, businesses, etc.) and civil society at various levels (Non-Governmental Organizations - NGOs, Community-Based Organizations - CBOs, local associations, etc.). It should be inclusive both vertically (cross-scales) and horizontally (cross-sectors). "Participatory" oriented planning is a process that fits a vision of polycentric- and network-based governance.

In certain cases, such approaches are implemented by the governments themselves. In others, they are promoted and developed by third parties like researchers, NGOs, universities or else. These approaches generally do not aim to replace NR governmental plans, but rather to provide plans in geographical areas, social or environmental issues, scales, time frames or social groups that are either not or poorly addressed by existing NRM plans. Research interventions, notably, can be experimental and aiming at "testing" processes, approaches or concepts. One risk of participatory planning approaches driven by third-parties is to lack legitimacy and ownership. However, even though these approaches are not directly initiated by authorities and are therefore outside of the official decision-making sphere, they are still susceptible to influence decision-making. As highlighted by Innes and Booher (1999) "*though [they] typically take place outside the conventional processes of public choice, [they] influence elected officials, bureaucratic agencies, and courts. Because participants often represent important players and because they may produce feasible solutions where other efforts have failed, [such] proposals may be the ones that are used*".

Even if the need for more integrative, adaptive and participatory planning approaches is now widely recognized, such approaches are not easy to implement in practice and face major difficulties and challenges (Allan and Curtis 2005). This has led to two major criticisms about participatory approaches in general and about participatory planning processes in particular.

The first major criticism relate to the fact that participatory, communicative and collaborative planning approaches tend to focus on the process while overplaying the wider context in which the participatory process takes place (Healey 2003; Fainstein 2000). One, among other possible solutions, to overcome this limitation is to make an in-depth analysis of the institutional context surrounding the participatory process (Blackburn & Holland, 1998; Williams, 2004). This argues for the development of in-depth understanding of the local context.

The second major criticism relates to the inability of participatory and/or planning processes to account for issues of power (Huxley and Yiftachel 2000; Healey 2003; Fainstein 2000). Participatory processes are meant to empower grassroots stakeholders by giving them a say in NRM decision-making. However, the "mainstreaming" of participation as a requirement in most development projects has tended to obscure local power differences, therefore "depoliticizing" development (Williams, 2004). Indeed, many development projects using

participatory approaches tend to overlook existing divisions within communities, in terms of gender or power relations (Guijt & Shah, 1998). As a result, marginalised individuals and groups are included in the process but are not necessarily able to question existing structures of power, even less to suggest alternatives (Bell & Park, 2006; Kothari, 2001; Mosse, 2001). Even though power inequalities may not be entirely manageable, several strategies exist to challenge them. First, power issues need to be taken seriously. Existing power dynamics need to be acknowledged, identified and analysed for example by undertaking stakeholder analysis previous to the planning process. Second, the process may use tools and frameworks to challenge power dynamics and make them more visible (Cullen, Tucker, Snyder, Lema, & Duncan, 2014). Facilitation techniques such as "world café" (Brown 2005) or strategic group-making can be used for that purpose. Third, we need to acknowledge the influence that development experts involved in the participatory planning process may have on the process and its underlying dynamics. Experts and facilitators have their own agency, motivations, norms and values which they spread through the participatory encounter (Williams, 2004). Effort to clarify all participants' agenda at the beginning of the planning activities can help in this regard

The challenge is thus to operationalize a participatory planning approach which is strategic, adaptive and avoids the pitfalls of participation.

2.2 Tools for participatory and adaptive planning in a complex system perspective

As underlined previously natural resources management in general and planning in particular supposed to mobilize information and knowledge to formulate action schemes, integrate them in different dimensions (landscape, social dimensions, and scale) and assess the strategy thus elaborated along a vision and outputs which are expected to be reviewed and amended as situations and conditions evolved. Planners look for tools that can facilitate the understanding of the situation, select actions, facilitate integration and plan assessment as well as its adaptation and review with evolutions and occurring changes.

Knowledge in the complex system framework of social-ecological system approach is both uncertain and pluralistic as we saw in part 1.3.2. Tools and methods addressing complex system also only have a limited predictability capacity. In such system, solutions are not right or wrong but more or less acceptable (Norton 2012). The quality of the decision is thus essential that is in other words the quality of process which leads to the decisions.

Furthermore adaptation lies in institutions and networks that learn and store knowledge in order to create flexibility in problem solving and are able to balance power among interest groups. Collective and iterative learning and combining different types of knowledge also contribute to the development of self-organization and adaptive capacity. Processes which facilitate the building of institutions and learning such as social learning, are thus instrumental to address complex adaptive social-ecological system.

In social learning oriented processes, participants are expected to develop relationships and network of actors and to benefit from three types of learning (Ducrot *et al.* 2014; Ferrand and Daniell 2006a): specific learning on the issues dealt with that is on system functioning (substantive learning), instrumental learning that is learning on the method, tools and approach for autonomous

implementation to allow for adaptation and at last “social” learning: this latter type of learning include the development of cognitive capacity to get an holistic representation of the complex system including issues understanding, actors and relationships; development of moral insights concerning values and principle that can sustain other types of practices or behaviour such as respect of others, sense of collective interest and social skills (empathy, collaboration mechanisms); new reasoning schemes (integration of knowledge, capacity for collective solving of problem or negotiation). Social learning process are thus expected to lead not only to high level cognitive change with the development of new knowledge and integrative perspectives but also brings relational changes (such as mutual understanding, establishing trust and relationships) (Muro and Jeffrey 2008). This relates to double loop learning (Argyris and Schön 1996) where normative learning can lead to more radical institutional changes, by questioning for example the fairness of existing rules.

In this perspective, tools and instruments are not viewed as a way to inform rational and univocal decision-making: Although they can be instrumental into supporting the introduction and development of new ideas and discourse, policy interpretation, in contributing to conflict resolutions and providing material and technical support for operational management, they are used to share perspectives and understanding between stakeholders groups as well as to strengthen links and relationships.

Providing knowledge on complex system is challenging since if it is easy to characterize the elements of a system it remains challenging to describe linkages, feedback loops and the dynamics features which characterize them. Various approaches have been recommended to overcome this challenge: Adaptive management, based on experimentation allows for testing hypotheses about the functioning of the system. Simulation tools and scenario building approach have also proved interesting. This is particularly the case of social simulation models such as multi-agent models which are acknowledged as powerful tools to address the specificities of complexity such as the capacity of emergence, non-causality and non-linearity. Yet the need to involve a large diversity of stakeholders including some actors with low level of formal education raises specific challenges to this kind of tools (Becu *et al.* 2008).

2.3 *Simulating natural resources management with role playing games*

Social simulation refers to the exploration with computers of social phenomena (e.g., cooperation, competition, markets, social networks dynamics, etc.) through modelling and/or simulation. The modelling and simulation of social systems as complex non-linear system helps to understand social dynamics and explore social issues. As scenarios based approach they are also useful to tackle the uncertainties of complex system. In the field of environmental management, social simulation models allow to directly and explicitly combining social and environmental dimensions.

But the complexity of this type of modelling and simulation limit their interest in a participatory and multiple perspective setting. In order to facilitate the sharing of these perspectives, a modelling approach called companion modelling based on iterative steps of participatory modelling and simulation has been developed where participatory modelling and simulation is used to elicit and confront the

perspectives of a group of actors on the functioning of their system (d'Aquino and Bah 2014; Etienne 2011; Le Page *et al.* 2013)

To facilitate communication on the model framework, the models are adapted in role playing games (RPG). In RPG-based simulation, players enact their own role and make explicit the way they interact and react to given situations. All the rules and dynamics embedded within the underlying model spin from information and knowledge of the "real world": RPG tools integrate scientific, technical and traditional local knowledge concerning different dimensions of the socio-ecosystem such as landscape (hydrology, forestry etc), institutions, economic environment, livelihood etc. They allow representing in an integrated and explicit way the interactions between the social dynamics and the ecosystem. By having participants mobilizing a diversity of information to make individual and/or collective decisions, it helps them build an understanding of this information and gives a concrete meaning to INRM concepts.

RPG thus allows exploring the complexity of social interactions and issues around natural resources management, but in a participative manner. In a RPG based simulation, a group of stakeholders is allowed to interact and make decisions within the frame of pre-defined roles over a dynamic representation of their socio-ecosystem. It means they can interact with dynamic parameters of a complex model including possibly spatial, ecological, economic, social and political dynamics and get direct feedback from their choices in the model. In this way they can experiment possible courses of actions and potential evolutions of their system.

Role-playing games can fulfil diverse functions according to the context. Bots and Van Daalen (2007) identified six different categories:

- Research and analyse: the system cannot be studied or is difficult to study because of its complexity, and the game is used as a scientific experiment to generate data on this system;
- Design and recommendation: the RPG is used to build scenarios and alternative solutions to a problem, and possibly try to figure out their consequences;
- Provide strategic advice: The RPG contribute to advise on the efficient strategy to be followed, by looking at other players' reaction;
- Mediate: players (potentially stakeholders of a real project) use the game as a virtual negotiation table. The environment of the game, different though similar to the real life, is expected to help raising fresh ideas.
- Democratize: all the stakeholders are given the same importance during the process of the game, and all their views are equally considered.
- Clarify values and arguments: compared with a real-life situation, the game allows the focus of the discussion to shift from political consideration to values and arguments.

RPG can be computerized or not but non-computerized RPG such as the Wat-a-Game sessions allow a large flexibility as evolving the model does not require code modification but rules modifications which are easier to implement. **This flexibility** is particularly important in a participatory setting as modification can be implemented "on the spot".

WAT-A-GAME¹ is an open toolkit developed by IRSTEA and CIRAD which enables participants to design and run simulations for water management, policy design and education. The basic version of the game aims to show how water moves within a landscape, how it is used, polluted, transformed and shared by actors. Using WAG, participants can simulate various actions or strategies and assess the resulting impact on their household economy, their wellbeing, labour, and the surrounding ecosystem. WAG has been designed to be used by a range of stakeholders, including farmers, scientists, experts, administrators and policy makers. WAG is described in detail in *Annex 4: Wat-A-Game Platform* and its application in *Afromaison* in sections 4.1.2.2 and 5.2.3 below. WAG can be adapted to individual cases, various land and water management issues and different scales. The design of specific games using the WAG platform encapsulates a participatory situation analysis for the chosen ecological unit. As a companion modelling approach, the WAG paradigm also assumes that the design and building of the model supporting the participatory simulation (the game) is as important as the game itself in the overall learning and decision process (Abrami *et al.* 2012).

A wide (infinite?) range of resources and process can be simulated with pebbles and simple rules, the only limit being that the RPG should stay playable. These resources evolve according participants' uptakes and simple rules of modification, regeneration and/or dislocation. All calculations are totally transparent, which avoids any kind of black box, while providing a dynamic perspective on the studied landscape, going beyond "snapshot" and static map. They are thus particularly adapted to introduce complex functioning with actors of low level of literacy.

Yet, such simulations may be thought of simple but they are all but simplistic: they bring complexity issues to life by having participants resending them in their role play. The learning curve of participants is generally fast and their level of concern high as they easily acknowledge the constraints and actions they face in their everyday life. Participatory modelling allows for **capitalizing** on different knowledge and information while the simulation process itself enables the **emergence of new integrated knowledge** on the socio-ecosystem.

After 10 years of experience in the development of RPGs coupled or not with other tools it appears that good RPG for INRM should remain games and be fun to play (Etienne 2011). It means that participants should have good time and peculiar interactions with each other, while being able to push attitudes within their role-play they will be able to discard later if they want because in this fictive world choices do not bear hard consequences. These unique both recreational and realistic characteristics make them particularly powerful to engage participants into a process as complex as INRM and to mobilize them for further activities.

Their inherent coarse-grain nature does not allow for fine tuning and a session will last a couple of hours, involving a limited number of participants for the simulation of a few rounds only. However a non-computerised RPG session can produce very sharp insights on options or strategies and consequences of actions. It means that systematic assessment and long term view may be addressed through a carefully planned and focused discussion based on the RPG experience. A well-structured debriefing is crucial to be able to efficiently explicit

¹ www.watagame.info

these insights and make the most of the individual and collective reflexive thinking they generate.

Their major drawbacks are (i) They are slow to implement and it is often difficult to run more than a few rounds per session which makes them inadequate to assess long term impacts (ii) Technicians (and some scientists) may fail to take them seriously because of their "low tech profile" and "gaming aspects"; (iii) The variability of the social context (who plays whom) makes a formal analysis of the substantive outcomes difficult which could only be overcome through statistical analysis provided a sufficient number of repetitions of the game has been undertaken.

2.4 The operational framework of Afromaison

The operational framework of Afromaison (AfM-OF) has deliberately been developed within the framework of **participatory and adaptive planning** and a perspective of **networked meso-scale level**. It requires the integration of multiple sectors, levels, stakeholders and time-frames in an implementable strategy. Following the literature review on planning in complex systems, multi-level participation is viewed as a key determinant of the relevance, institutionalization and social integration of the planning process and strategy. To facilitate the engagement and mobilization of all levels and types of stakeholders in building and testing a strategy that combines actions of different natures, it draws upon workshops mobilizing different participatory exercises and tools.

Natural resources management requires engaging large sets of stakeholders in dealing with complex situations, integrating multiple sectors and combine political framing, coherence seeking, real engagement and sustainable implementation. It faces two main challenges: (1) embracing the complexity of socio-ecosystem functioning where hydrological, ecological, social, economic, governance, and cultural dimensions cannot be disconnected from the process and its outcomes (2) effectively involving a wide range of stakeholders and sectors (citizens, NGOs, administrations, policy and decision makers, industry, experts) in the different steps of the planning process: assessing situation (actors, resources, well-being, drivers) and envisioning evolutions in the face of global changes; normative framing and stating goals; proposing and specifying different actions (natural resource use and management, regulation instruments, information, organization...); structuring a coherent multi-sector, multilevel plan, and finally overall assessment of this plan.

Because of the variability of the stakeholders to be engaged, tools and processes must facilitate the sharing and integration of different types of knowledge while taking into account the low literacy level of some stakeholder groups in Africa. Consequently the process favors low-tech structuring tools that avoid black box effect and can be easily understood and transferred. This choice also facilitates autonomy of local communities and partners in managing the process, which is expected to allow for its large scale social extension in the long term and minimizes direct alien or expert intervention.

In this process, non-computerized role-playing games (RPGs) allow for social exploration and simulation of these plans, accounting for the complexity of social interactions and issues, with stakeholders sharing the same table. They interact and make decisions under constraints, facing a dynamic representation of their

socio-ecosystem. They can interact with dynamic parameters of a complex model, and they can especially exhibit and confront their mutual behaviors and their regulation. With enough resources for proper training of facilitators, RPGs can be disseminated on a large scale.

The operational procedure for NRM planning includes six main phases:

1. **Procedural agreement**, in which the different steps of the process adapted to the local context are designed and validated with the main stakeholders (or champions) along with process designers. In the AfM project designers were the local research teams (CS level) working jointly with the WP7 team.
2. **Evaluation and identification of a long-term common objective:** Actors' possible, expected and worst case futures and boundaries conditions are then shared, which allows for eliciting their perspectives, values and preferences. It is also at this stage that process designers check that the environmental, social, political and economic diagnosis of the current situation is shared. Some tools such as Just-A-Grid (see Annex 1: JUST-A-GRID tool) can be used to discuss distributive justice preferences. Indicators of achievement of the common objective must be selected.
3. **Actions identification:** Different options for intervention are identified and characterized by stakeholders using a common action template. Different kinds of actions are expected to be mobilized at this stage stemming from either local or expert knowledge, but information concerning their contextualized impacts and requirements is needed so that they can be properly characterized. This information is summarized in a generic action template (see Annex 2:), used as a basis of discussion between stakeholders.
4. **Selection and integration of actions (planning):** Action are integrated and organized in time, space and organizational scales. The COOPPLAN matrix (COOperative PLANning, see Annex 3: COOPPLAN Matrix) can be used for this purpose: it is a simple and versatile protocol and a formatted matrix, with which actions are combined in strategies and their feasibility, coherence and efficiency are investigated. The resource needs (financial, labour, political power etc.) and the expected impact on indicators are qualitatively assessed and discussed.
5. **Test of the plan using a participatory simulation tool (role-playing game):** a generic modeling toolkit, called Wat-A-Game (see above), is proposed to build socio-ecological models and the related role-playing games to explore new actions, policies, and scenarios with participatory simulations. The design of the game is expert-based with multiple inputs from champions and meso-level stakeholders for readjusting and simplifying the game components and dynamics 'on the way'. A protocol combining planning and gaming (simulation) is used in order to explore, test and improve the plans. The RPGs can also be used in the action selection phase to enlarge the understanding of the system and facilitate brainstorming for actions identification.

The game was configured in each case study by a team of main modellers (one for each case), who were introduced with WAG through two training sessions in June and August 2011 (three weeks in total). Case study specific games were initiated, developed and refined during these sessions and by confrontation with local champions and key informants inputs and feedback. UMR G-eau team provided support when needed for the refinement of the games and organization of simulation sessions and related participatory workshops.

In the AfM-OF, the WAG modelling and simulation process had a function in facilitating shared understanding and knowledge interaction on system functioning. But the WAG based sessions principally aimed at testing the strategies, by assessing the overall coherence and get direct feedback on actors using a situated action paradigm (Conein and Jacopin 1994). This paradigm emphasises that any action are context dependent per essence and thus the significance of one action (and consequently decision making process) cannot be disconnected from the situation in which it is being implemented and decided. Consequently feedback on decision making or choice has to be connected to a given context and one can only understand decision making in action. The game as an experimental situation can help understand of the individual decides in action and thus provides stronger feedback and assessment on the strategy, and thus help to refine it and "validate" it.

6. **Implementation plan:** It is then necessary to design the procedure to make the strategy operational in organizations and administrations: that is, to specify the different steps, resources and commitments needed to implement the final plan. The implementation plan aims at collectively specifying the administrative tasks, budget delivery (for staff hiring, training, equipment, investment, etc.), need for information dissemination, and monitoring and assessment. This operationalization of the strategy is important for its effectiveness and for successful impact on natural resources management and sustainability.

The operational framework mobilizes expert and stakeholders 'knowledge (citizens, NGOs, administrations, policy and decision makers, communities' residents etc). It only uses the available data for calibration, and does not require extensive data collection. Consequently, its main outcome is qualitative: it provides no predictive capacity. Its key value is social and political that is really engaging all stakeholders and improving the relevance and viability of the action plan through coherence, commitment and implementation support. This process can be accompanied by a comprehensive monitoring and evaluation protocol (see part 5) allowing a thorough description and analysis of the participatory planning process, its context and multiple impacts (in perceptions and institutions).

2.5 The innovations of the operational framework of Afromaison

The framework itself has been designed and tested in a previous EU funded project (*Aquastress*) (Ferrand and Daniell 2006a; Ferrand *et al.* 2006). Yet the

Afromaison project permitted to fine-tune the process as well as develop different procedural innovations notably:

- The transfer of the OF and some of its structuring tools (COOPLAN, RPG, Implementation Plan, JUST-A-GRID, ENCORE-ME) at case study level so that the approach can be developed with limited inputs from OF or tools specialists while allowing its adaptation to local context specificities.
- The organization of expert knowledge production in the project that is workpackage (WP) work in a way which allows for its integration in the planning process and its confrontation with local knowledge.
- The development and test of an approach permitting large scale and multi-scale mobilization of stakeholders to address the meso-scale challenge
- The use of RPG as a tool not only to facilitate shared knowledge and holistic understanding of a situation but to test a strategy.

2.5.1 *An approach to transfer participatory tools to local teams*

As previously underlined, five tools are emblematic of the AfM-OF (see Part2: Annexes): (1) a RPG based on the Wat-A-Game platform; (2) JUST-A-GRID, a simple transferable method apparatus for eliciting, discussing and choosing principles for shared resources' allocation; (3) COOPLAN (including action templates): a protocol and a formatted matrix, to facilitate the combination of actions into strategies and discuss their feasibility, coherence and efficiency; (4) ENCORE-ME the monitoring and assessing protocol of the process; (5) the implementation Plan Matrix.

Most of them results from previous work and had already been tested. In this project the challenge was their transfer and dissemination to local teams so that would be able to adapt them to specific local context.

Transferring the RPG game was particularly challenging as it supposes a modelling process representing local social ecological system (using the Wat-A-game platform) and the development of the game elements. Specific attention was thus given the transfer of the RPG and companion modelling approach. This was done through a training process in two times:

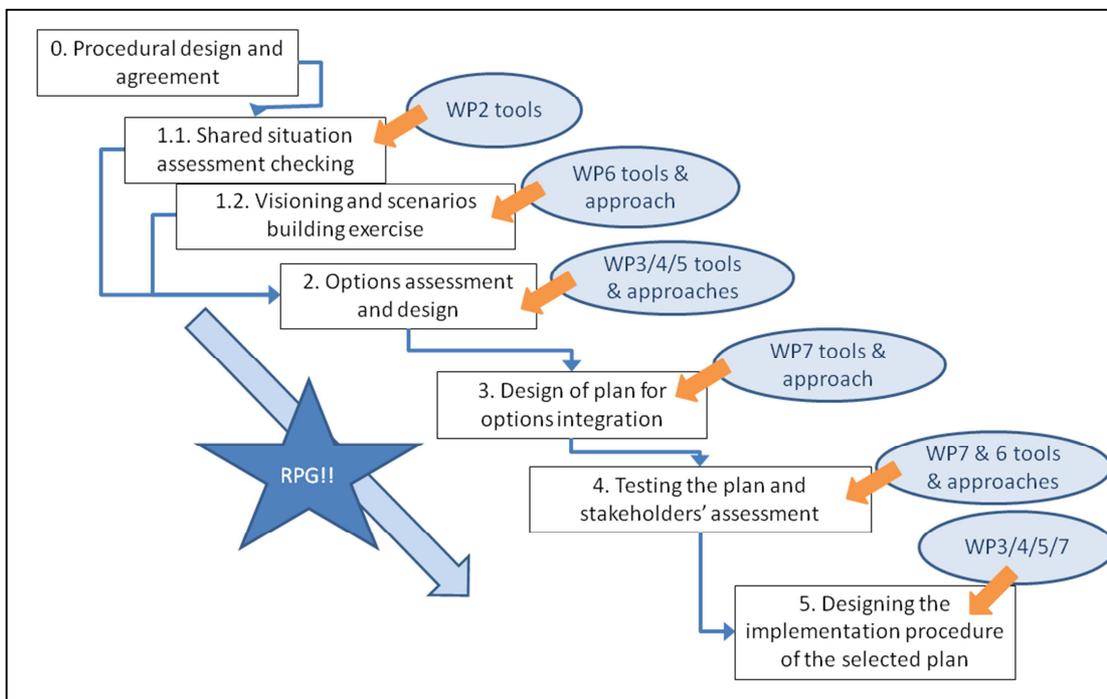
- 1) A first workshop introduced the different tools to team members selected in each CS to accompany WP7 process. WP leaders were also invited to participate. A training-by-doing approach was retained as participants developed some of the tools around case study they selected.
- 2) In each case study, a modeller (trainee) was trained and accompanied over a 3 months period by UMR G-eau game specialist so that they could master the modelling approach and build a game adapted to local issues. A first 15 days workshop permitted to provide trainees with the basis of game development. The outcomes were the elaboration of a first version of their game. The trainees had then one month and a half to complete missing information and modelling work. During a second 10 days workshops the game were presented, modified and finalized and a game implementation plan elaborated. Senior UMR G-eau researchers were committed to long distance monitoring and support to the different trainees.

The others tools which were easier to master were discussed and adapted during the preparation phase of case study participatory workshops.

2.5.2 *Integrating experts and stakeholders knowledge in the planning process*

The OF was conceived so that expert knowledge gathered in the different WP could contribute at different stages of the process, as illustrated in the following figure. For example WP6 had a structuring role in the visioning and scenario building phase of the diagnostic while WP4, 5 and 6 were expected to contribute to the options identification, their assessment and design.

Figure 1: Coordination between Afromaison Operational Framework and inputs from WPs



Concretely coordination was expected to develop through interaction at CS level. The CS team had an important role in this coordination process as local implementers of the WPs. The CS team was thus in charge integrating the outcomes and outputs from the different WPs with the contributions of “local” stakeholders, with the help of WP7 team. To facilitate the integration process, a CS plan of activities was build that gathered the different WPs activities and tasks organized around the adapted local operational framework. It was however not easy to implement as the project was structured around WP (and not CS). Timing delays in the development of the WP work also resulted with some problems of alignments with the development of the OF.

To facilitate the process, WP7 team organized or encourage one “integration workshop/meeting” gathering both CS leaders and WP leaders at the beginning of the project and during each project meetings.

2.5.3 An approach for large scale dissemination and monitoring and evaluation of the game

In the Rwenzori, the participatory planning process was extended at various scales starting from the meso-scale, down to the local scale and to a lesser extent up to the national scale. Work at the meso-scale was planned as envisioned in the AfroMaison operational framework. It was also decided to proceed to large scale extension at local scale of the activities to respond to three considerations: the will of the Ugandan team to better involve local communities in the process, a partnership with a well-established network of agricultural organizations (SATNET) and enthusiasm generated by the role-playing-game (Hassenforder s.d).

This large scale extension raised various methodological challenges namely: legitimacy of the actor(s) in charge of the extension and their effective ability to reach and mobilize a large number of communities, the transfer to extensionists of the participatory planning approaches and tools that could be effectively used at community level, the coordination of this local processes with the meso-scale process, the adequate monitoring and assessment of field activities. in a

MMU is a community university it has the mandate and skills to reach out to the Rwenzori communities. A partnership was created with the Sustainable Agricultural Trainers Network (SATNET). SATNET works through a network of community process facilitators (CPFs) originating from and based in about 50 communities. SATNET selected the 35 most dynamic communities to be part of the process. They were scattered throughout the Rwenzori region which permitted a large geographical coverage. The local groups involved are dedicated to specific activities, mainly farmer field schools, credit and savings, and drama productions. One church group, one student group and one "boda boda" (motorbikes) and bicycle riders group were also involved.

Thus the extension lied on existing groups of stakeholders, established norms and joint resources. The planning and gaming process was added to the usual operating set up of the local drama, credit and saving and Farmer Field School groups. Facilitators (as well as rapporteurs see below) were trained in game facilitation and monitoring and evaluation from November 2012 to April 2013. 35 versions of the MpanGame, which had already been used and validated with meso-scale stakeholders, were produced locally and given to each CPF.

Thus various aspects permitted this large scale extension: it made use of an existing network of development not necessarily directly related to NRM. The approach proposed could be entirely mastered by local facilitators (not hired by the project) inclusively the main tool (Mpan'game) due to its low tech profile. This main tool mobilized could be used in different way along the process which facilitates the training process.

To monitor and evaluate all the local workshops in this large scale extension scheme, five "rapporteurs" were hired to monitor the process in the communities. They originated from one of the five to eight communities which they were in charge of and spoke the local dialects. The five rapporteurs were trained to participant observation. Since neither the rapporteurs nor the local facilitators were used to taking notes or debriefing workshops, guidance was provided to them respectively through a "rapporteur debriefing sheet" and a "facilitator debriefing sheet". The sheets included open-ended questions

describing the process and its outcomes. The other M&E methods which had to be adapted to the local scale was the questionnaires. To adapt to the low literacy level in the communities, only five questions were included which could be rated by ripping the paper at the appropriate place in a 5-point semantic differential scale. At the end of each workshop, rapporteurs took pictures of the documents produced thanks to an electronic tablet which they were equipped with. An online database was created with a simple interface for the rapporteurs to seize the information included in the documents using the pictures they had taken. All project team members could access the database. This system was set up following up a request of several communities to keep the M&E documents produced.

The planning of activities was designed to allow participants to assess the situations, discuss their local social and environmental issues and suggest innovative actions which could be implemented to address them. One workshop per group was dedicated to the development of a local plan using the knowledge gained with the game. These local plans were then supposed to be presented by the CPFs the meso-scale participants during a regional workshop held in order to be integrated with meso-scale plan. The output ("Rwenzori regional INRM plan") was then feedbacked to the communities: Communities discussed the Regional plan, amended their local plan when they felt it necessary and discussed implementation.

In total the process permitted to reach an average of 17 participants per communities, in 35 communities, allowing to reach 597 participants and involving 32 CPFs and 5 "rapporteurs". 27 local plans were elaborated (some communities stopped the process or could not draft their plan in time)

2.5.4 *Using RPGs to test the strategy*

Although there are different ways to use RPGs for NRM, most of the time Companion Modelling games have been used to share perspective on a complex system as well build understanding on the social and ecological interactions of the system. In the Afromaison project it was proposed to use RPGs not as a diagnostic tool but as a way to discuss and test the strategy. The approach proposed and the methodological choices are more specifically detailed in part 5.2.3.

3 Adapting the approach to the local environmental, political, institutional and development context

3.1 Presentation of the case study contexts

3.1.1 A variety of ecological situations, environmental stakes and drivers of changes

The AfM project was carried out in five case studies whose main features are being recapitulated in the opposite boxes. They cover a variety of ecological situations from semi-arid Oum Zessar watershed to the humid mountainous areas of the Rwenzori Mountains in Uganda.

The environmental issues include **biodiversity preservation and encroachment of aliens species** (Oum Zessar, uThugela, Rwenzori mountains, IND), **erosion and siltation of related water bodies** (Oum Zessar, Fogera, uThugela), **land degradation** (Oum Zessar, Fogera area, uThugela), **degradation of rangelands** (Oum Zessar, DIN, uThugela), degradation of fish populations (IND), modification of flood regime (IND).

Drivers of changes include **population pressures** (Fogera, Rwenzori mountains, uThugela), **climatic changes** (Fogera, Rwenzori Mountains, IND, Oum Zessar), **upstream water development** (IND), **privatization of land** (Oum Zessar).

Two types of case studies can be differentiated: those dealing with **large ecological systems** of more than 5000 km² (uThukela, DIN, Rwenzori mountains) and more localized ecological systems (Fogera and Oum Zessar).

All case studies were selected due to the engagement of research teams in the area so that the intervention could build upon previous knowledge and data.

In three cases (Rwenzori, IND, Fogera), the ecological systems supported the livelihoods of a population which is mostly rural or engaged in commercial activities related to the natural resources.

In Oum Zessar, there was a clear concern from the start of the intervention on economic issues, notably related to unemployment and migration processes that were understood to drive either over-exploration of some resources or the insufficient maintenance of other parts of the system.

In uThukela district, although economic stakes were the main preoccupation of most actors (Pommerieux 2012) they were more implicit implied (ecotourism in the preserved area or farming activities in the other areas) than clearly articulated with environmental stakes.

The Rwenzori Mountains (Uganda)

The Rwenzori region covers an area of 13,970 km² in the west of Uganda. The region has a tropical bimodal climate with a wide variation of climatic conditions, including: wet lowland, dry savannah, wet mountain forest, and alpine forest. Land use is divided in agricultural/grassland and built-up areas; water bodies and wetlands; and, natural woodlands and plantations (of this 46% is Tropical High Forest). The region is flanked by four protected national parks.

Oum Zessar Watershed (Tunisia)

Located in south Tunisia in Medenine governorate, it has a 350 km² surface area. This site is part of the Jeffara plain of Tunisia, and presents a **arid Mediterranean climate** with an average rainfall of 160 to 220 mm per year in 30 days. Water resources are a major constraint for pastoral (sheep and goats) and agricultural (cereals and olive trees) activities and local inhabitants water supply (24,188 ha in 2004).

This site is a **typical agro-pastoral area** with a gradual and, in some areas accelerated, **expansion of cropland at the expense of natural rangelands**. In fact it displays a very significant eco-environment vulnerability, degraded vegetation in rangelands, and intensification of agricultural use in plain areas. This region has been a target area of the main national strategies for natural resources management and combating desertification (through water resource and soil conservation, pasture and rangelands preservation, prevention of sand encroachment and rural development).

Blue Nile/ Fogera area (Ethiopia)

The Fogera catchment (2000 km²) is located in the Lake Tana sub-basin, in the headwaters of the Blue Nile, in the Amhara Region that represents high rainfall (i.e. 1,800 mm).

The catchment supports semi-subsistence agriculture based on crop-livestock systems including irrigation, and wetlands, in area with rapidly increasing population and significant land degradation issues (deforestation and loss of land cover, erosion, water quality degradation).

uThukela District (South Africa)

UThukela District (11 500 km²) is located in the upper Thukela catchment in the Drakensberg mountain grasslands. The northern areas of the mountain range of forms the border between Lesotho and South Africa.

The region is extremely important for its watershed services as it drains predominantly into the Thukela catchment, from which water is pumped over the Drakensberg and into the Vaal river system, which supplies water to Johannesburg. It is also important from a biodiversity perspective and comprises largely high altitude moist temperate grasslands.

The Inner Niger Delta or IND (Mali)

It is a large inland flood plain (41 500 km²) and one of the four major hydrologically distinct components of the Niger Basin. It has international importance for biodiversity, but it is also crucial for the livelihood support of one million people that depend on the Delta's resources and ecosystems. Regionally the low level of development and advanced state of degradation of natural resources (due to climatic disturbances, human pressure and upstream development) expose the Delta's population to severe food insecurity. Furthermore the IND's position downstream of the Upper Niger makes it subject to developments in the upstream basin; therefore the status of the IND is intrinsically linked to the effects of water resource management, and upstream agriculture and industry development.

Table 1 : Territory, zoning and governance institutions of the *Afromaison* case studies

Case study	Territory studied	Zonation used	Governance institutions
Oum Zessar	Oum Zessar watershed – a small watershed 350 km ² , no governance bodies	Catchment divided into 2 zones (upstream mountainous Jbel and the Jeffara plain, itself divided in midstream and downstream parts)	The CRDA (Commissariat Régional au Développement Agricole) is in charge of agricultural development in the case study, and particularly of water resources management and soil conservation. CRDA was identified as a champion for the Afromaison project implementation and a formal convention was signed between OSS, IRA and CRDA to carry out the process of developing INRM plan for the watershed. The catchment is part of the « Gouvernorat de Medenine » and includes parts of 4 « délégations ». The absence of governance institution argues for the creation in the plan of a steering committee (CLAMO) with representatives of local actors
Fogera catchment	Small catchment (Gumera watershed approx. 2000 km ²). Incorporates most of the Fogera woreda (administrative area – 1088 km ²) in lowlands.	Downstream, middle stream and upstream of the watershed for the biophysical processes and Fogera district (woreda) and villages for socio-economics processes	The Kebele (village) administration plays a decisive role in terms of local governance including resources uses. Woreda is the lowest level at which regional and national government agencies operate – The iAfM intervention also considers upstream/downstream dependencies around water (and erosion) by also looking at catchment. Through another project the intervention deals also with the national level but the regional level has not been successfully included.
UTukhela	District Municipality of uThukela (11 500 km ²) which is a governance delimitation (including several local municipalities)	3 main zones initially (the World Site Heritage – a protected area; its adjacent buffer zone, and the outside zone). These latter two were divided according to tenure system. ES mapping helped refining the zoning.	The chosen territory is a decentralized level of administration (District Municipality DM) located between the Province (Kwazulu Natal) and the Local Municipalities. This administrative and territorial unit was acknowledged by most actors as relevant. The AfM intervention identified the need of having a governance institution to facilitate implementation of the strategy
Rwenzori Mountains	Rwenzori region 13,970 km ² : 7 districts, with an average size of approx. 2600km ² .	The area is divided into 7 districts. The upstream/midstream/downstream division initially introduced was not finally considered as the 35 communities were part of different catchments.	The district has the administrative mandate for management in non protected areas including resources uses. The region itself is not an administrative but is the territory of intervention of several (governmental?) organizations and NGOs”. In protected areas, resources management is under the government responsibility through parastatal entities. At regional level. AfM intervention was integrated within one of the several forums (Rwenzori development framework) connecting the different organizations.
Inner Niger Delta	Three “cercles” (Tenenkou , Mopti and Youvarou) of approximately 10 000 km ² , out of the 8 cercles of the IND (itself 41500 km ²)	The 3 selected <i>cercles</i> are situated in the upstream and lake part of the IND. Each one is characterized by the predominance of one type of resources (fisheries, grassland, crop land) and is divided into communes.	The “ <i>cercle</i> ” is the decentralized administrative unit at which land use planning has to be developed. Traditional institutions that managed the different resources are now organized at cercle level. At a larger level, the overall “Region” which includes more or less all the area of the IND is meaningful for INRM but coordination with other state organizations acting at regional level would be necessary (Office du Riz etc.).

3.1.2 *The meso-scale level in the case studies*

Although the interventions were for many team member justified by decentralization progresses, in none of the cases studied, was there a clearly identified decentralized institution whose mandate directly fitted the ecological system studied at meso-scale.

Consequently the choice of the studied territory was a compromise between an ecological unit that made sense (a watershed, the flooding area, or an ecologically homogenous area) and a governance unit where the planning of development, land use and/or implementation of (environmentally related) policies makes sense.

In most of the cases there was a combination of works done at the scale of the ecological unit (for example analysis of the ecological dynamics, ecosystem services mapping) and within the governance unit (for example analysis of the socio-economic and governance issues).

Table 2 : The meso-scale institutions mobilized in the case studies

Supra level	Selection	Large ecological system	Small ecological system
A decentralized institution encompassing the studied ecosystems with a clearly defined mandate for policy implementation	of the territory managed by the larger scale institution (including all administrative sub-units)	uThukela (District Municipality)	
	of the sub-administrative unit that has mandate on natural resources management	IND : cercle (administrative units are selected to be representative of the variability of environmental situations)	
No decentralized institution with a policy implementation mandate matching the ecological system	Of all the administrative sub-units which have a mandate on natural resources management	Rwenzori mountains institutions and organizations	
	Of one administrative sub-unit with mandate on natural resources management		Fogera Woreda
	Of the ecological unit only with mobilization of representative of administrative sub-units		Oum Zessar catchment

When there were no decentralized institutions that made sense from an ecological point of view, three possible choices existed (Table 2): 1) selecting all the administrative units with a mandate related to natural resources that were and use them for the planning process, 2) incentivizing the emergence of networked governance system or 3) working at a planning sub-unit. The case of

Oum Zessar is specific in the Afromaison process because of its very small size compared to other case studies on one hand, and on the other hand because the planning unit remained the ecological unit and was not extended to an administrative unit.

Even when decentralized institutions areas were used for the implementation of the AfM-OF (for example in uThukela), it appeared necessary to foster cooperation with other institutions (with a mandate over different resources and/or intervening at different scale or in different sub-territories) either after/or during the process itself for different reasons. In one hand not all institutions which intervened in the landscape studied were subjected to the administrative logic or hierarchy of the selected institutions, and on the other hand because historical and territorial divide demanded coordination.

Thus, the interventions clearly favored polycentric approach to governance as previously characterized although this has not necessarily been clearly conceptualized at case study level. The coordination between the local actors or level and the national levels was also unequally developed. Generally the relationships between local level and meso-scale level were accounted for, sometimes explicitly and in a clearly organized manner (Fogera, Rwenzori) sometimes more loosely (uThukela, IND, Oum Zessar). The interactions between the national level and meso-scale have been more loosely accounted for although the importance of the area studied at national level have been emphasized (uThukela and DIN).

At case study level, the specific function for meso-scale institutions had rarely been clearly specified by the team. It thus often remained unclear and implicit. At most, case study team acknowledged a need for planning and policies implementation or enforcement and sometimes the need to organize the coordination between various organizations. In uThukela case study the interest of sharing information at local scale was also emphasized. It was thus not clear what justified meso-scale approach beyond accompanying decentralization and/or the interest to fit the planning processes to ecosystem boundaries. This could jeopardize the long term sustainability of the approach as a political justification is needed to ensure long term engagement of actors.

3.2 One operational framework, various approaches

3.2.1 Oum Zessar (Tunisia)

In Oum Zessar, the operational framework was driven by a steering committee composed of members of OSS, IRA and CRDA (the Regional Administration responsible for agricultural development). Consultation was structured around a series of 20 local and regional formal meetings involving mainly experts from the research team (OSS, IRA) and representatives of CRDA at meso and local scale. The participation of other local stakeholders (in particular natural resources users) was more limited, partly because of the sensitive political situation following the Tunisian Revolution. Most of the analysis was conducted by 5 thematic working groups (TWGs) (forest and rangeland, water resources, soil and water conservation, socio-economic analysis and economic instruments, and agricultural production) and 3 district working groups (DWGs) corresponding to the 3 sub-basins (Sidi Makhlouf, Medenine, Beni Kedache). These groups were

composed mainly of representatives from IRA, CRDA and few local actors (farmers, CTV, NGOs) (OSS 2014).

Situation assessment was carried out by research team from IRA (Sghaier et al, 2011) with the support of ICRAF/ICRAF with the support of the local research team, using the important knowledge accumulated by the numerous past or on-going research projects conducted in the area, and interviews of key stakeholders (Migongo-Bake *et al.* 2012). It was further complemented by a qualitative assessment of ecosystem services (scored by stakeholders) and a survey on the livelihoods of 120 households.

Initial vulnerability assessment was conducted by the TWGs during 5 workshops (or sessions in multi-purpose workshops) from December 2011 to February 2013: 3 focal issues were initially proposed by the TWGs, and then merged in a unique one "How to preserve and manage the water resources and the socio-agro-ecological system for sustainable development?" Key drivers of the current NRM situation were identified, ranked and organized in a conceptual map. These results were then discussed by a larger group of stakeholders. A second scoring was undertaken with a revised set of drivers. Four scenarios organized around the success or failure of the Revolution and the modalities of economic growth (globalization versus regionalization) were described. In addition future trends of climate change were analyzed. Three of the four scenarios were parameterized in terms of water allocation between sectors (agriculture, tourism, domestic and industry) and their impacts under climate change were assessed using the WEAP model (Liersch and Reinhardt 2013; 2014).

The process for selecting actions used a mix of expert and local knowledge. TWGs and DWGs identified an initial list of 82 actions, relevant to their respective sector or region. This list was then submitted to stakeholders at regional and local levels. Actions were described and assessed using an adapted version of the action sheet (but not all items were documented). This list of actions was confronted to the government programs and projects for the area. ES mapping was used to prioritize actions in each sub-basin. More specifically, soil and water conservation interventions were selected by combining an inventory of actions undertaken under government programs since the 1980s, the WOCAT database and specifically acquired biophysical data (Lewis *et al.* 2014). However the final plan does not mention these detailed actions and groups them under a generic label. ES mapping was used to assess the impacts of past SWC actions on ecosystem services provision (Vandenbroucke *et al.* 2013). Assessment of economic instruments and design of incentives for soil and water conservation (subsidies) was carried out using the DST and DeMax tools in a workshop with the TWGs (Lewis *et al.* 2014). However, no economic instrument was finally integrated in the final strategy. While, other instruments scored better with the DST tool, participants chose to analyse the potential of environmental subsidies, because this instrument was already used in Tunisia and seemed easier to implement. If most of the actions included in the final strategy involve a certain level of government financial support, environmental subsidies are not identified as a separate action in the final strategy.

In each sub-basin, identified actions were ranked by a stakeholder group and 40 actions were finally selected to build the strategy. Local sub-basin plans were submitted for discussion to local stakeholders and specified in terms of beneficiaries, content of the intervention, and implementation plan. Spatially organized in 3 sub-basins, the strategy is also thematically structured in 4 domains (soil and water conservation, rain-fed agriculture development, road infrastructures and social equipment, development of economic fabric and

income-generating activities). The report specifies the estimated investment costs for each selected action.

There was no assessment of the strategy as such. Although a specific role-playing game was developed for Oum Zessar, it was not used with stakeholders, neither to identify actions, nor to test the strategy.

Time constraint limited the development of a detailed implementation procedure for the validated strategy. Some measures conceived by the research team were discussed by meso and local stakeholders during the last workshop: A new committee was proposed for facilitating the implementation of the strategy, monitoring and evaluating its progress, and mobilizing financial resources. In particular it was proposed to submit the plan to international donors (FAO, EU, World Bank, IFAD, etc.). A scientific observatory, managed by IRA was also proposed for monitoring rural development and INRM in the Oum Zessar watershed (Sghaier *et al.* 2014).

3.2.2 Fogera/Blue Nile (Ethiopia)

In Fogera, the operational framework was driven by IWMI, but the coordination and governance of the Case Study was weakened by changes in IWMI staff members. The case study leader changed at the end of the first year, and the IWMI researcher in charge of implementing the various actions on the ground (Mulugeta Lemenih) left at the end of the second year. Nevertheless, a very positive contextual aspect of the process was Fogera being a common CS to AFROMAISON and the CPWF Nile Basin Development Challenge (NBDC) project driven by ILRI. As such there was a dissemination of tools and outcomes among the 2 projects. This loose collaboration notably allowed participatory workshops organized by AFROMAISON to rely on the Innovation Platform (IP) group of stakeholders which had been formed by the NBDC and composed of government offices, NGOs, researchers and community representatives. However there have not been many efforts in linking the interventions from the different WPs and in ensuring a continuity of the IP members participating in it.

Situation assessment was carried out in early 2012 by ICRAF with the support of the local research team, using some knowledge of past or on-going research projects conducted in the area and more generally in the Ethiopian highlands. Another baseline survey focused on livelihood strategies was carried out shortly after by NBDC (Dessalegn 2012). Early in 2012 also, the scenario design work was carried out by WP6 and M. Lemenih with 25 IP members during a 1 day workshop. Further work on scenario design was done in the lab by PIK experts but was not reused afterwards. Later in 2012, M. Lemenih also carried a quantitative and qualitative assessment of Ecosystem Services which completes the baseline surveys. The quantitative ES mapping was redone later with a different group because of the insufficiency of the landcover data used at this time. A link was done with the work carried earlier under NBDC on Soil & Water Management interventions which resulted in expert based selection and characterization of 35 practices and their edition and "intervention cards" which can be used in the "Happy Strategy" game (Pfeifer and Notenbaert 2011) and mapping their suitability to landscape units (Notenbaert *et al.* 2013). However it was difficult to further include this work in the OF due to a shift of focus from general natural resources degradation issues including water provision to fodder and grazing management on the one hand, and the departure of M. Lemenih on the other hand.

The WP7 intervention somehow started when the WP7 team got invited in early 2012 by NBDC/ILRI to hold a 4 days training workshop on WAG / COOPLAN tools in Addis-Abeba. Later on in the year M. Lemenih was involved in the 2 intensive WAG/COOPLAN training workshops held in Tunisia and Uganda. This is when the anthropologist Beth Cullen from NBDC/ILRI, who had been trained in Addis, saw an opportunity in initiating a joint NBDC-AFROMAISON effort around the WAG / COOPLAN framework which she thought could be able to bring in power and representation issues which were lacking in the Fogera IP. A series of 3 2-3 days workshops held between December 2012 and September 2013 with a large group of about 50 stakeholders mixing farmers and IP members from all levels and an extended facilitation team of 6 to 8 people from both projects (Hassenforder *et al.* 2012b; Hassenforder *et al.* 2013a; Hassenforder *et al.* 2013b). These workshops mixed elements of the OF (WAG, COOPLAN) and other tools and methods brought in by the NBDC team (happy strategy cards, participatory video projection, imaginary illustrative case studies narratives, world café...) and wisely alternate plenary sessions and smaller groups activity so that views from the different types of stakeholders and the different types of landscapes could be nicely formulated, exchanged, discussed and sometimes merged. A specific aspect of this CS is the strong choice which was deliberately made after the first workshop to restrain the focus from integrated resources management to free grazing. The rationale was to use a sensitive and political stake as an entry to minimize the risk of obtaining a blanket strategy and use the workshops to deconstruct it and properly state its dependences with the natural resources dynamics to get back to INRM.

They resulted in 2 strategies elaborated in parallel by farmers on one side and the other stakeholders on the other side, a merged one elaborated by mixed landscape groups, and 3 preliminary implementation plans for each landscape units elaborated by mixed groups. At the end of the last workshop, several participants committed in a committee which will be in charge, with the support of ILRI / IWMI, of seeking funds to push the realization of the implementation plans in 3 pilot villages. A draft ToR has been written but ILRI/IWMI staff is at the moment lacking time and resources to push and support this process.

Finally, a 1 day workshop with 12 high-level IP members was carried out independently in mid-2013 to work on economic instruments and apply the DST / DeMax tools.

3.2.3 uThukela (South Africa)

In order to facilitate the implementation of the strategy, the uThukela Case Study Team (CST) decided to coordinate the AfM process with the building of Environmental Management Framework (EMF) – a legal requirement for the District Municipality (DM). As a component of the Municipality's Integrated Development Plan (IDP) which governs municipal planning and decision making, the EMF aims to produce a Strategic Environmental Management Plan (SEMP) detailing management plans and actions to address key environmental issues.

Thus while the baseline study of the situation– including political analysis (Bourblanc 2012) were undertaken, the CST engaged with the DM, the EMF steering committee and consulting firm to organize the interaction. As a result the baseline information (the stakeholder database, baseline spatial information, literature and information) gathered in WP2 was supplied to the EMF team; the AfM CST attended the EMF stakeholder meetings and the EMF team were invited

to the AM stakeholder consultation. The CST also started off participating in the synergy group, an informal platform gathering government agencies, programs and several NGOs involved in natural resources management in the area. It helps in getting a better understanding of the various initiatives and challenges and enabled linkages with local community workers.

A first Integrated Stakeholders workshop (17 July 2012) gathering 32 participants (6 CST members) was permitted to present the AfM process, update participants on outcomes of the baselines studies, present the ecosystem services approach and its draft outcomes, present the draft scenarios analysis (expert-based) and verify key INRM issues as hierarchized by the team (INR 2012). The duration of the workshop only permitted to achieve a superficial level of detail/understanding. Draft scenarios were met with scepticism and lack of support may be for not having been developed with stakeholders but the visioning /scenarios exercise was not carried any further in the AfM process. Monitoring and assessment of the workshop underlined a discrepancy between CST expectations (an integrated strategy) and those of participants (mainly an increased understanding of the INRM concept)(Pommerieux 2012). This suggested that more capacity building was required, the need to better advertise the objectives of workshops and review the form of interactions with SHs.

The different tools and support including Ecosystem services maps, the WAG based Amanzi game and the DST/DeMax tool were then developed. From May 2013 to Nov 2013, three main types of interactions with actors were undertaken (1) A draft list Sustainable Land Management (SLM) interventions were submitted during a day workshop to a selected group of meso-scale actors in order to refine it, identify geographic priority areas, analyses institutional challenges and provide guidance for different socio-economic and biophysical contexts (INR 2013b; McCosh *et al.* 2013). (2) the Decision support tool (DST) and Design Matrix tool (DeMax) were run with focus group of different management in order to select economic tools (Lewis and Zunckel 2013). (3) Six focus group workshops mobilizing certain types of stakeholders (community members, developers and researches; tourism representatives; government and conservation sectors) were implemented. They aim to test and refine the game, facilitate the analysis of existing interventions and support brainstorming for other interventions and complete the diagnostic through participatory mapping (Waldron 2013).

The inputs of these workshops permitted to propose in each key zone a list of possible interventions or broad strategy which was submitted for discussion in a Final /2nd Integrated SH Workshop (18-19 October 2013) gathering 37 (5 members of the CST) . After summarizing the Afm approach and objectives, the progress and outcomes of the work (ES mapping, Economic tools selection and approaches, SLM selection and approaches) were presented but they were no presentation of the game session outcomes. The strategy were then finalized in each main management zone (WHS, Buffer Zone and Other), and the sub zones (communal and private tenure) by participants through a participative exercise involving selecting activities to address different objectives. The last part of the workshop was devoted to review existing governance structure in order to define the most appropriate structure for implementing the strategy(INR 2013a). The different institutional options for implementing the strategy were also testing in a game session (19 November 2013) gathering 8 representatives of different STH groups (community, environmental NGO, government bodies dealing with conservation and environmental) (Waldron 2013).

The outcomes of all AfM consultation were provided to the EMF team to increase the amount of stakeholder inputs they could draw on. This included the Visions from the initial workshop, all the technical workshops and the WAG game session reports. Finally the AfM strategy was integrated into the EMF draft documents for comment.

3.2.4 Inner Niger Delta (Mali)

In Inner Niger Delta (IND), the operational framework was driven by Wetlands International (WI) local office in Mopti. Major security issues in the country started in early 2012 and disturbed the process. Fieldwork had to be postponed or cancelled and most workshops had to be organized either without European partners presence, either outside Mali. The IND CS was connected to various international and local projects, including OPIDIN which aims at embedding the flood forecasting tool elaborated since 2009 in Mali operational management structures and disseminating it.

The WP2 situation assessment was done in time in early 2012, but due to the troubles, the official launch of the project could only happen in mid 2012. The Ségou workshop gathered for 4 days about 20 stakeholders from various institutions involved in the DIN natural resources management (administrations, research and NGO) plus 5 representatives from local communities groups and 3 mayors. Important procedural elements were amended such as the 3 meso-scale focus sites, a list of stakeholders to involve and pre-identified champions, and questionnaires for fieldwork. One focus group issued tables of impacts and adaptation strategies for WP6 climatic scenarios issued from the FP7 WETwin project the different users. Another one pre-identified which economic instruments from WP4 already exist in the DIN, and which ones may be appropriate for the DIN. Wat-A-Game was introduced through the presentation of an early prototype.

The WAG tool in the DIN CS is called JeuDIN. It represents an archetypal portion (about 1/10th) of one of the chosen cercles and has been developed by Mori Diallo from WI with WP7 support through a series of training workshops from February to August 2012. JeuDIN was actively shared, fed and improved with WI staff and Segou workshops stakeholders visited individually during July 2012. The impossibility to physically come to support WI delayed further improvements and testing for nearly 1 year. JeuDIN was played for the first time with stakeholders in the July 2013 Ouagadougou workshop. They acknowledged its fine representation of the complexity of the DIN issues but also some calibration and playability issues for bringing it further down to local communities. After some minor polishing, JeuDIN could be ready for dissemination and replication for the other *cercles*.

The strategy building work started at the end of 2012 with the identification of local option through a series of focus group in each meso scale and with different occupational groups (66 people overall). The second stakeholders workshop was then held in Mopti in may 2013 with about 20 institutional stakeholders including 2 mayors. The local and expert options available from the previous steps were presented, and the stakeholders analysed issues with the DPSIR methodology, prioritized 3 specific objectives, and specified for each one, a strategy made up with 3 chained actions, assessing their resource needs, roles and responsibilities. In July 2013, a 3rd workshop was organized in Ouagadougou for WP4 and WP7 with a reduced group of 10 stakeholders including 3 mayors and 1 representative

of women's group. WP4 was able to run the DST and DeMax tools over the specific objectives from Mopti workshops, which generated interesting discussions on the implementation of the strategies. For WP7, the objective of merging and enriching the strategies with non-technical options and testing it with JeuDIN was only partially met. JeuDIN was used for the first time and was not mature enough for assessing the strategies even though some options were played. Additional non-technical options obtained from the WP4 exercises discussion were selected and combined with Mopti strategies elements using COOPLAN elements, but the result was felt as a deconstruction of Mopti work by WI staff and stakeholders. A last workshop was held in November 2013 in Sévaré with 8 stakeholders only. They specified roles, resources and responsibilities for the list of additional options from Ouagadougou. The 3 strategies from Mopti were then reviewed and enriched with the addition options, the more appropriate economic instruments, as well as OPIDIN, but could not be differentiated over the different meso-scale conditions. It is worth mentioning some tensions on the approach of strategy development with WP7 advocating for an integrative complex strategy while WI was more keen on specifying sub-strategies related to differentiated specific objectives and was quite critical on the importance of livelihood oriented options in the final supposedly natural resources management oriented strategies. WI is now advocating for the 3 complementary meso-scale strategies (water provision, mitigation practices, technical and organizational capacities) to be included in an IWRM plan to be funded by the Dutch government.

An ES mapping workshop was held in early 2013 but the results were left standalone because of the subjectivity of the scores. SWIM hydrological modelling and prediction of different hydrologic drivers on the DIN resources production was developed by PIK over 2012 and used to inform stakeholders during workshops. This work still has to be connected with OPIDIN.

3.2.5 Rwenzori Mountains (Uganda)

The Ugandan Case study followed the participatory planning process as stated in the operational framework. However, the implementation approach and the context of implementation differed in each case study.

In Uganda, the participatory planning process was first implemented through a group of about 30 meso-scale stakeholders (regional government officials, religious leaders, representatives of civil society, farmers, businesses, etc...). It comprised a series of 4 workshops over 16 months (from Apr. 2012 to July. 2013). This process allowed developing 3 INRM meso plans which were tested with a role-playing-game (called "MpanGame" from the name of River Mpanga flowing through the region) based on the Wat-A-Game toolbox. The focal issue identified by the participants is "sustainable natural resources management for socio-economic development" (Hassenforder *et al.* 2012b). The main environmental and societal issues in the area include water pollution, deforestation, wetland encroachment, poor agricultural practices, intensification of agriculture and corruption. From January 2013, the process was extended at the local scale (downscaling) to 35 communities, each of which developed their own local plan through a series of 2 to 8 workshops per group over 12 months (January-December 2013). At the local level, the game was used as a tool, not to test the plans as with the meso group, but as a basis for identifying potential SLM interventions in an iterative way. In July 2013, the 4 meso plans and the 27 local plans (some communities stopped the process or could not draft their plan

in time) were merged by the participants themselves into a draft regional INRM plan that was adopted in June 2014 by a Network of stakeholders from the region engaged in NRM called the Rwenzori Regional Development framework (RRDF).

One of the main differences in the context of process implementation in Uganda was that the process was initiated by local intervention research (a community university). The team members were themselves participants in the process in the sense that they came from the area and played a role in the focal issue addressed through their everyday activities while having good pre-existing relationships and trust, particularly with meso scale civil society participants.

During the first workshop in Kasunga, the Decision Support System (WP4) was tested and various economic incentives were explored with the stakeholders. Various other tests of the DST and DeMat were subsequently run by team members and other close stakeholders which allowed refining the tool and identifying economic incentives which could support the implementation of the actions listed in the plan. Scenarios (WP6) were developed where one assumption is that policy implementation improves and law enforcement becomes more effective while environmental awareness of people in the region does not change over the scenario period. Scenarios, along with hydrological models and ecosystem services were used to assess ex-ante the strategy and its potential impacts (WP3). Qualitative assessment of around 20 individual SLM practices was made following the workshops and Mpangame sessions for further investigation and inclusion in the final strategies.

Figure 2 : Simplified representation of the Rwenzori Mountains process



4 From shared diagnosis to collective building of strategies.

4.1 Formulating the strategies

4.1.1 Shared diagnosis –analysis of situation and challenges

The starting point for formulating INRM strategies in each case study was to establish a shared understanding of the current status, issues, drivers and dynamics of natural resource management. To achieve this, a range of different approaches were used including

- Rapid assessment based on analysis of literature and interviews with key stakeholders;
- Ecosystem services assessment and mapping;
- Initial vulnerability assessment for scenario formulation;
- The role-playing game simulation

Consultation with stakeholders was integral to situation analysis in all case studies, including a range of formal and informal approaches. Structured interviews with key individuals formed an important component of preliminary rapid assessments. Formal group consultations were central to the research process in each case study. The format of these consultations varied between case studies, depending on the context, conditions and communities in each. For example, in the Blue Nile / Fogera, where Afromaison worked with the Innovation Platforms (IPs) established under the Nile Basin Development Challenge project, approaches used to engage stakeholders included formal meetings, field visits, the participatory role-playing game, and participatory video², where community members from Fogera produced a video to present their perspectives on land and water management - see Cullen (2013). The consultation process in each case study is summarized below (Section 4.1.2.1).

Despite the differences in approach, there were two important points in common across the case studies. Firstly, widely diverse stakeholders were consulted, including farmers and herders, village representatives, religious leaders, non-government organisations and local and district government representatives and decision makers. Secondly, the process of establishing a shared diagnosis was iterative – there was no fixed end-point. As the studies in each case study progressed, understanding of the systems evolved, and each of the stakeholder meetings included a component of revisiting and re-establishing agreement about issues and priorities. Table 3 shows how the focal issues of Afromaison’s intervention evolved along the process from the initial rapid assessment to the role-playing game simulations through the scenario building exercise.

² <http://nilebdc.org/2012/03/29/a-rope-to-tie-a-lion-community-voices-on-livestock-water-and-soil-management-expressed-through-participatory-video/>

Table 3 : Evolution of the focal issue along the situation assessment and visioning process

Case studies	Local NRM issues pointed out in the rapid assessment report	Focal issue selected in the scenario building process	Focal issue of the simulation game
Fogera	<p>Soil degradation (especially in the highland) leading to siltation of the lower plains and Lake Tana</p> <p>Deforestation and conversion to cropping land</p> <p>Reduced availability of water leading to conflicting access (particularly for irrigation), with climate variability and change impacting on farming performances</p> <p>Declining biodiversity</p>	<p>Vulnerability of food production (security) to low land and water productivity under climate change, poverty, and population development in 2011-2030 and 2011-2050.</p> <p>Vulnerability of ecological health to land degradation, climate variability, population development, and the increasing demand of food production in 2011-2030 and 2011-2050.</p>	How to control free grazing in order to avoid soil erosion while ensuring livelihood needs?
Inner Niger Delta	<p>Destruction of key habitats and biodiversity loss (flooded forests, « bourgoutières »)</p> <p>Decreasing fish stock due to over-fishing and habitats destruction</p> <p>Reduction of floating rice cropped areas</p> <p>Decreasing and degrading range lands leading to the reduction of livestock breeders' revenue</p>	<p>Threatened attributes or attributes of concern :</p> <ul style="list-style-type: none"> • Food production/security • Livelihoods • Ecosystem integrity, services and functions 	how to manage livelihoods in sustainable way (fully depending on Ecosystems services), in accordance with water level entering in Inner Niger Delta (upstream management of water and rainfall) and to reduce conflicts
Oum Zessar	<p>Privatization of lands, resulting in reduction of reserved rangelands and increased pressure on remaining pastoral areas.</p> <p>Critical level of use of the limited water resources, limiting agricultural and pastoral development</p>	How to preserve and manage the water resources and the socio-agro-ecological system for sustainable development?	Management of water resources for rural development in Oum Zessar watershed

Case studies	Local NRM issues pointed out in the rapid assessment report	Focal issue selected in the scenario building process	Focal issue of the simulation game
Rwenzori	<p>Increasing deforestation to create new cropping land</p> <p>Decreasing biodiversity, due to the reduction of indigenous forest and introduction of new crops</p> <p>Soil degradation due to poor agricultural practices on steep slopes, leading to siltation of surface water bodies (rivers, lakes)</p> <p>Wetland encroachment for agricultural and residential purpose</p> <p>Potential impact of climate change on river flows</p>	<p>How to practice sustainable intensification with agro-ecological systems in order to reduce short term vulnerability of the population, to improve livelihoods, and to preserve ecological integrity in the long term in order to secure sustainable use in the long term? (October 2011)</p> <p>Sustainable NRM) for socio-economic development (April 2012)</p>	<p>How to ensure individual and collective livelihood needs with sustainable resources management activities, replacing illegal activities with legal ones that are more respectful of the environment and equally or more income generating ?</p>
uThukela	<p>Severe soil degradation due to high grazing pressure in the communal areas and inappropriate soil management in the commercial farm area</p> <p>Loss of biodiversity (both plant and animal species) due to degradation of grassland and savannah and their transformation for agricultural , industrial and residential developments</p>	<p>What are the implications of current management frameworks on ecosystem services (particularly water regulation) and poverty reduction in the uThukela District, particularly in the face of growing human demand and climate change?</p> <p>Central issue : Land degradation</p>	<p>Interactions between land use practices of the different type of rural land owner (community, commercial farmers, conservation area) and water availability, quality (siltation), land degradation as well as jobs in an area gathering the 3 management zones identified.</p>

Source: (Liersch and Reinhardt 2013; Waldron 2013; Migongo-Bake *et al.* 2012; Ghazouani 2012; Hssenforder *et al.* 2013; Abrami and Cullen 2012; Kabaseke *et al.* 2013)

Preliminary rapid assessments

For each case study, a multi-disciplinary assessment was made of the context across sectors, scales and disciplines, reported in Migongo-Bake *et al* (2012). These assessments were based primarily on review and analysis of existing studies and reports, compilation of secondary data and interviews with key stakeholders. Where insufficient information was available, this was supplemented by rapid assessments using a range of well-developed and tested community-based tools developed by ICRAF and IWMI (see below). The analytical framework used in the assessment was 'drivers-state-consequence-response options' framework currently used by the CGIAR Consortium Research Programme (CRP) on Forest, Trees and Agroforestry.

Tools used in the rapid assessments included Participatory Landscape Appraisal (PaLA) and Participatory Analysis of Poverty, Livelihoods and Environmental Dynamics (PAPOLD), employed in the Rwenzori and Fogera case studies; SWOT Rapid Appraisal of Drivers of Land Use Change (DriLUC), used in the uThukela case study. See World Agroforestry Center (2012) for a full description of these tools. Less formally structured focus group discussions and key informant interviews were used in all case studies.

These assessments provided an analysis of opportunities and constraints for landscape functioning, livelihoods, and cultural and institutional arrangements for each case study, including review of prevailing policies and action plans such as local development plans, National Adaptation Programs for Action (NAPA), food security strategies, nature conservation plans, and water resources management plans.

Initial vulnerability assessment for scenario formulation

An initial vulnerability assessment, conducted as a precursor to scenario formulation and assessment formed one component of the situation analysis for the case studies. Initial vulnerability assessments are described in Liersch and Reinhardt (2013). Scenarios of potential future development were explored for each of the Afromaison case studies, to assess the uncertainties of future impacts and adaptation strategies and to stimulate the visioning process. Scenarios are a component of vulnerability assessments and are used to improve and challenge management strategies and development plans. Scenario assessment in Afromaison is described in detail in Liersch and Reinhardt (2014). In the uThukela CS only an expert based scenarios analysis was undertaken which was met by scepticism by stakeholders and the exercise was not carried any further.

The purpose of the initial vulnerability assessment was to provide a preliminary overview of past, recent, and likely future trends of drivers, pressures, and threats for all case studies. The assessments were mainly qualitative, comprising definition of precise research questions (storylines), problem structuring using the DPSIR (drivers – pressures – state – impacts – responses) framework, scenario building, and identification of indicators to assess, simulate, and project future system states. An analysis was made of past and recent climate as well as future climate projections. One outcome of the scenario building process is a conceptual map (Cmap) that represents the inter-relationships between relevant key factors and driving forces, roughly following the DPSIR framework. Storylines and Cmaps were derived based on existing information (including

Migongo-Bake *et al* 2012), combined with information from consultation of groups of stakeholders in workshops convened specifically for the purpose.

Ecosystem services mapping and assessment

The Afromaison project was conceptualized around an ecosystem-based approach to NRM. Ecosystem based management emphasizes the interconnectedness of human and ecological well-being, and uses integrated systems concepts to incorporate the effects of management on multiple ecosystem services (ESS) (Tallis and Polasky 2009; TEEB 2010; Millennium Ecosystem Assessment 2005). Use of an ES approach supports INRM by making explicit:

- links between landscapes, livelihoods and well-being
- multi-functionality of land units and trade-offs between different land uses, users and sectors
- diversity of ES available (supply) and used (demand)
- Equity of benefit distribution (local vs external, immediate vs future benefits).

An ecosystem services approach to NRM was developed for Afromaison, described in full in Vandembroucke *et al.* (2013) and Interwies *et al.* (2012). This approach included identification of the full range of ESS provided by the landscape, mapping of patterns of supply and demand for each ESS, and description of stakeholders influencing or benefitting from them. ESS analysis thus provides a framework for describing spatial relationships between people and landscapes (using supply of and demand for ES); multi-functionality of land units (range of ES types); equity (where and to whom ES benefits accrue); and vulnerability (threats and pressure to ES supply).

Initial ESS mapping was conducted using a participatory version of the method developed by Burkhard and Kroll (2009); Burkhard *et al.* (2012) where stakeholders scored ESS supply and demand from each land cover unit. In addition, stakeholders were asked to comment on perceived trends in ESS provision. Qualitative assessment of ES supply and demand based on stakeholder inputs is a useful way to capture the values attributed to landscape elements by different users, and the tradeoffs between different land uses. Mapping the spatial patterns of supply and demand of ES can help to identify priority "hot spots" for conservation and restoration, in areas where multiple ES are delivered or where demand outstrips supply.

The land-cover table scoring approach to ESS mapping lends itself well to situation analysis, since it is simple, both conceptually and in terms of data requirements; and it captures local knowledge. It is explicitly subjective (relying on scoring by individuals or groups), and so can be used to explore perspectives of different stakeholders. However, the land cover is not always a suitable proxy for ESS provision (Eigenbrod *et al.* 2010). The underlying assumption that each land cover unit supplies ES uniformly is clearly an over-simplification, since ES provision is strongly influenced by factors such as land condition and seasonality. More complex approaches capture these effects and resulting variability more effectively, but require substantial amount of data (see for example Tallis and Polasky 2010).

In Fogera / Blue Nile, Lemenih *et al* (2012) conducted a detailed analysis of ESS status and trends based on analysis of existing secondary data, and unstructured

interviews with local stakeholders (four groups and ten individuals). Trends in ES supply were used to analyze trajectories in livelihood strategies from relatively diverse sources of income towards more of intensive crop production, with increased provisioning services at the expense of supporting and regulating services. The analysis emphasized the interactions and feedbacks between farming and grazing systems and ecosystem degradation, and formed one of the inputs for mobilization of the Fogera innovation platform and their later work on grazing management. However, in the other case studies, ESS mapping was carried out in the later stages of the project, and was thus not integral to situation analysis. It did, however, provide an important framework for prioritizing and identifying interventions (see Quayle and Pringle (2013)), and for exploration of the impacts of interventions (see (Vrebos *et al.* 2014).

Role Playing Game using the Wat-A-Game platform

Although role playing game was not initially developed to contribute to the elaboration of a shared diagnostic, the design and customization of role playing game was an important component in constructing a shared diagnosis and situation analysis. The reasons for this role lay in its intrinsic quality: synthesis ability, demonstration capacity especially to stakeholders with little formal education as well as mobilizing characteristics. This was all the more important that for different reasons (delays in research development, workshop attendance etc), the presentation of the outcomes of the different diagnostic assessments (rapid assessment, ESS, vulnerability assessment and scenario) has not been formally undertaken for all stakeholders.

In each case study the modelling process (describe above) mobilized the previous knowledge of main modellers, information gathered from assessment reports and analysis as well as stakeholders inputs and feedback to identify and summarise the main issues, agents and relationships to be simulated in the game.

The simulation settings varied in each case study which impacted the way diagnostic was shared and discussed; For example in uThukela, six workshops were carried out with different stakeholders target (for example District Municipality or communities representatives or actors involved with communities). The game was used to initiate a broader discussion around the dynamics affecting natural resources in the area studied, the challenges or contribution of existing interventions that was followed by the participatory elaboration of maps synthesizing the INRM challenges of the area. But as the workshops ran relatively late in the process all the information gathered during these workshop was not fully integrated in the latter stage of the process.

4.1.2 *Tools and approaches to identify and select interventions*

Afromaison developed tools and approaches to support case studies to identify, select and assess sustainable land and water management (SLM) technologies and other interventions as components of INRM strategies. The aim was not only to find individual solutions to specific land and water management problems, but to identify interventions that combine (as strategies) to provide synergies across the landscape, and increase resilience of livelihood systems at both farm and landscape scale. While traditional approaches to NRM often tend to address the

symptoms, rather than causes, of land degradation, INRM attempts to identify underlying drivers of mismanagement, and looks for common causes and solutions across issues and sectors. The principles of INRM, and the strong emphasis in Afromaison on stakeholder participation, opened up the discussion in the case studies to encompass a wide range of socio-political, institutional and economic development issues and interventions, going often far beyond land and water management. The INRM strategies formulated by the Afromaison case studies are thus very broadly based, and embed interventions for sustainable land and water management within the context of social and economic development initiatives and actions.

The approach comprises 4 steps:

- Identification, which consists in listing options to address one or more environmental issues,
- Specification, or characterization of options in terms of resources requirements for implementation, time and space of application, and impacts of different types and levels
- Selection, which consists in choosing a limited number of options among a the long list that was identifies, and
- Integration, which is the arrangement of selected options in time and space, into a strategic plan.

As in the diagnostic with which this phase was closely interrelated, stakeholder participation was an integral part of identifying interventions in all case studies. Stakeholders were engaged using a mix of traditional modes of consultation, through formal meetings and surveys, and innovative approaches including participatory role-playing games (social simulation) and participatory video. Depending on the case studies, the type of stakeholders who participated, the way they were engaged and the tools and processes used to support the process differ. In addition to stakeholders' involvement, the option identification, selection and integration process also used expert knowledge elaborated or synthesized by Afromaison researchers. Two main categories of tools can therefore be distinguished:

- Participatory tools used during stakeholder workshops to facilitate the participatory identification and selection process, and
- Technical tools developed by the research teams under WP3-4-5 to facilitate selection.

These tools were combined in an integrated process to identify and select interventions in the case studies. Because of the ecological and cultural diversity of the case studies, the process differed somewhat in each; a summary of the main components used in each case study is provided below (section 4.1.2.1 Summary by case study). It will briefly describe the tools from the two categories and the processes used to integrate both sources of knowledge.

4.1.2.1 Summary by case study

Fogera case study worked with the existing Innovation Platforms (IPs) established under the Nile Basin Development Challenge project, at national and woreda (district) levels. IPs are network of stakeholders including government officials, farmers, researchers and community representatives. The local IP at

Fogera was the platform for running WAG sessions, from which one outcome was identifying and describing locally relevant interventions. Options and practices were identified through individual reflection and brainstorming in workshops, and through use of WAG. Facilitators also introduced practices previously identified by researchers in the NBDC project, and these were selected or rejected by participants based on their relevance. Practices were elaborated, described and organized by workshop participants in small groups, using the strategic integration matrix to select and organize the practices in space and time and to describe the requirements for implementation in terms of money, labour and knowledge.

Inner Niger Delta case study worked with communities in three “cercles” (districts) as well as regional stakeholders, through a series of workshops, focus group discussions and WAG. Local techniques of restoration and sustainable management of natural resources were identified through focus group discussions and a survey questionnaire developed by 2iE, with different occupational groups (farmers, fishers, herders). Stakeholders provided information on preferred local options to deal with food and water insecurity and ecosystem degradation, including implementation issues. (See Zare, 2013 for a full description). Further options included in the INRM strategies were generated during group discussions in workshops, with expert contributions from WI staff. Stakeholders discussed the applicability of various options and scored, ranked and planned timing and implementation of selected options into the 3 strategies. Implementation of the flooding forecasting tool OPIDIN and the dissemination of its forecast information was identified as important in various workshops and interactions with stakeholders in the entire IND (also outside of the framework of Afromaison) which indicated that improve flooding forecasts were needed to make optimize livelihood activities and to reduce livelihood investment risks. OPIDIN was selected and development of the tool coordinated by DNH, Dutch Embassy in Mali, DRH Mopti, WI and A&W. Stakeholders were consulted about how and when flood forecast information was to be disseminated to them. Economic instruments were identified using the DST and DeMax tools in a workshop setting, with a range of stakeholders. The simulation game specifically developed for the case was tested during the same workshop but was not mature enough for assessing strategies even if some options were played.

In Oum Zessar, consultation was structured around a series of local and regional meetings. On the technical side, five thematic working groups (TWGs) were formed by researchers, technicians and representatives of local stakeholders and regional services. At a community level, three working groups of local actors representing civil society were convened, representing the three districts (Sidi Makhoulouf, Medenine North and Beni Khedache) covering the three watershed zones (District Working Groups – DWGs). Each of these groups identified SLM actions and options relevant to their respective sector or region. Interventions relating to soil and water conservation and forest management were identified through inventory and assessment activities carried out by both TWGs and DWGs. Activities to develop rain-fed agriculture and promote agricultural productions (plants and animals) were identified primarily through expert inputs, based on socio-economic surveys and research activities by OSS/IRA on aspects of agricultural production. Activities to consolidate and support development of infrastructure, facilities and income generating initiatives were identified through discussions and activities of the DWGs, including workshops with local actors. All Working Groups contributed to analysis of the investment costs and impacts of proposed actions, their contribution to livelihoods, integration of the watershed in its regional and national economic

environment, and involvement of local population in the development process. Assessment of economic instruments and design of incentives for soil and water conservation (subsidies) was carried out using the DST and DeMax tools in a workshop with the TWGs, but none of the identified potential EI was selected by the working groups to be part of the strategy.

In Rwenzori, consultation was structured around the use of participatory simulation game Mpan'game, working with more than 30 community organisations across 35 villages in 5 districts. Mpan'game was used to build understanding of NRM issues and interactions, and as a framework to explore potential interventions encompassing both SLM actions and more broadly based socio-economic development initiatives. Interventions were identified at a general level, and not all were formulated in detail. They were broadly described using a generic action sheet (see Figure 3). Connections between options, and the scale (household, community, region) and timing of implementation were articulated using a strategic integration matrix which also described requirements in terms of skills, equipment, legal and organizational conditions, and cost (Figure 5). Economic instruments to provide incentives for implementation were identified using the DST tool (with stakeholders); but the design of incentives using the DeMax tool was conducted only with the case study team, due to the conceptual complexity, therefore economic instruments were not incorporated into the final strategy.

uThukela District case study worked closely with the uThukela District Municipality, drawing on the consultative processes established to support formulation of the Environmental Management Framework (EMF) These included formal meetings with a wide range of stakeholders, and the Synergy Forum (comprising government agencies, programmes and NGOs working in the area). Additional technical workshops and field trips were held, to engage the DM, local experts and stakeholders to provide feedback on potential interventions. There is a considerable body of expertise in the existing programs in the area, and technical specialists among stakeholders assisted in identifying and prioritizing the suite of management options described in McCosh *et al.* (2013); INR/IWMI (2013). Similarly, technical experts within the stakeholder groups were involved through a series of workshops in developing and testing the DST and DeMax tools used in prioritizing the economic instruments selected to support implementing the management actions. Selection of appropriate institutional structures for implementation was addressed in workshops with the full range of stakeholders, to understand benefits and short comings of various options and the criteria for optimal structure. The institutional options were then tested by running the WAG PRPG for the different structures with six diverse stakeholder groups.

4.1.2.2 Participatory tools for actions specification, selection and integration

Four participatory tools were used for specifying, selecting and integrating actions into strategic plan: the action sheet, the structured database of actions, the strategic integration matrix, and the role-playing games. They are described below. There was no specific tool developed for option identification but the participatory processes which associated inputs from stakeholders with information from experts and researchers are described in section 4.1.2.3.

Action sheet

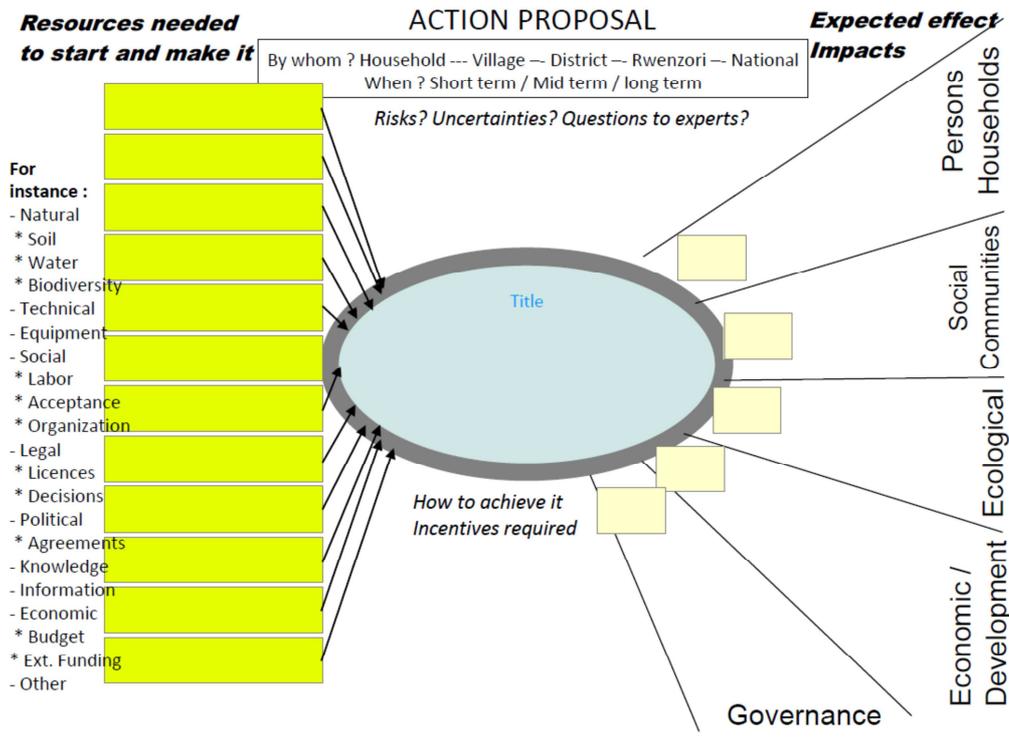
A generic action template in paper format (Figure 3) was developed initially for the Rwenzori Mountains case study. This action sheet brings participants of the participatory sessions to specify and discuss

- the resources needed to start and implement the action, which can be of material nature (e.g., money, labour, capacity building) or more immaterial such as political will and citizen acceptance,
- the different types of expected impacts (environmental, economic, social, governance) and at different levels (individuals and households, communities, district, region),
- the level at which it should be implemented (household, village, district, watershed, region, nation),
- the term of implementation (short, mid, long term),
- the risks and uncertainties associated with this action, the needs for additional information, and
- the necessary incentives to achieve it.

In Rwenzori, this action sheet was used to specify the options during the first stakeholder workshop. After a collective session of option identification, each stakeholder chose one (or more) action(s) and individually filled a template for each of the chosen actions. All the sheets were digitalized by the facilitators to be easier to read. In a next session, participants, associated in pairs, picked one sheet, exchanged their views about the proposed actions and tried to improve the content of the sheets during 10mn. Four rounds of exchange with changing pairs of participants formed what was called the "Action market place".

In Fogera, the action template was adapted and translated in the local language (Annex 5: Practice sheet used in Fogera first stakeholder workshop) and used in a similar way as in Rwenzori. In Oum Zessar a more formal version of the action sheet (not graphical and with additional characteristics) was created and used in stakeholder workshops. It is also used to present the actions in the final strategy report (see Annex 6: Example of action sheet used in Oum Zessar for an example). In IND, the action template was not used as such but the same kind of information was sought from stakeholders while building the strategy (see below). In uThukela the action template was not used at all, but options were somehow specified by using challenges cards during the strategy integration workshop (see below).

Figure 3: A sample action sheet (Source : Ferrand, N., 2012)



Structured database of actions

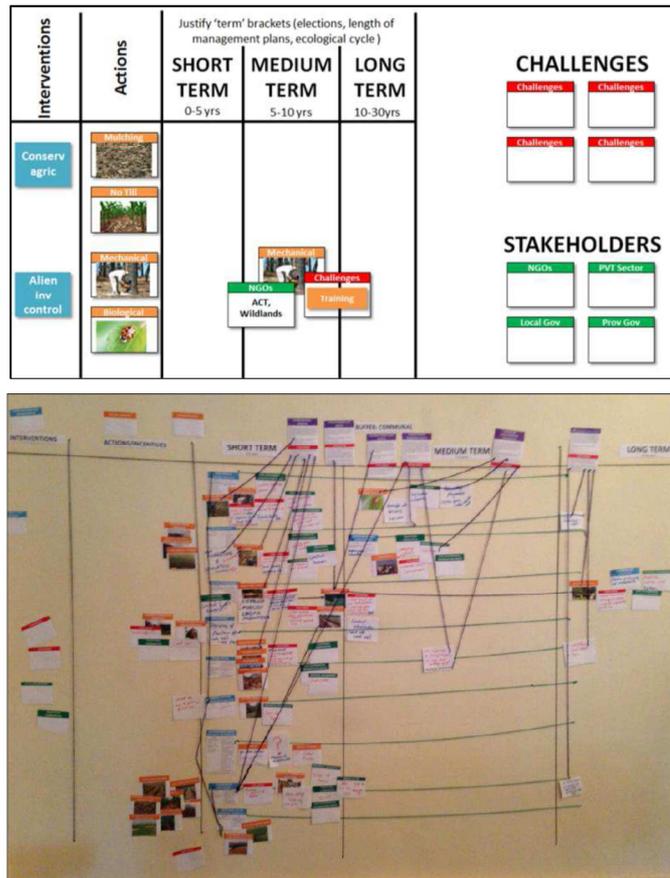
In Rwenzori, Fogera and IND a spreadsheet of the proposed actions, compiling the information contained in the action sheets was built (Figure 4). It was conceived as a working document, gathering in one place the contributions from stakeholders and experts, and evolving as the process unfolded. In Rwenzori, and IND, this database was refined and adapted to be used at a later stage as a basis for elaborating the activities in the role-playing game. In Fogera, the database of actions also mentioned the challenges attached to actions, the possible solutions to these challenges and the responsibilities to address them.

Figure 4. Extract of the Rwenzori action database elaborated from the first stakeholder workshop

(source E Hassenforder)

	K	L	M	N	O	P	Q	R
1	Action	Scale	Time	Impacts				
2				PERSONS HOUSEHOLDS	SOCIAL COMMUNITIES	ECOLOGICAL	ECONOMIC DEVELOPMENT	GOVERNANCE
3	promote building of small reservoirs	household, village, district, rwenzori		water available, labour required, income	group management, conflicts on water	water in ecosystem, local wetland	income, investment, diversification	local group for management, coordination
4	formation of water users groups	village	mid term	improved water quality, loss of jobs	improved resources management	improved ecosystem, increased quantity and quality of water	reduced costs in water purification, diverting of government resources (funds from alternative sources of income)	easier implementation of laws
5	restoration of degraded river banks	district	short term	relief from flooding, clean water	employment opportunity	increased biodiversity, balanced ecosystem	water for irrigation which increases agricultural production	development of management organisations
6	sustainable harvesting of natural resources	household, village, district, rwenzori, national	short term	equitable access to natural resources, sustainable supply/protection, reduced expenditure	equitable distribution of natural resources benefits, reduced conflict of resources, sense of ownership, increased productivity of crops, medicinal plants obtained	reduced pressure on biodiversity, protected and functioning ecosystem, habitats of plants and animals, reliability of rainfall	sustainable development because no environmental degradation/species extinction, tourism industrial development, development of research institutions	pressure on governance structures to regulate/control, reduced expenditure desistors
7	restoration of degraded forests	district	long term	increased availability of forests products (wood and timber), vermines and problem animals	increased access to forest products and resources (water catchment, tourism, wood and timber), conflict displacement of encroachers, vermines and problem animals	improved habitat for animals and plants/species conservation	services, water catchments, forest products (timber and wood)	capacity of responsible institutions involved in forest management, diversion of funds by host institutions
8	Construction of gravity water flow schemes	village		Health and hygiene is realized, health conditions of women improved	access to safe water	river pollution reduced, river banks protected	time spent on water collection is minimized, expenditure on health related cases is reduced	establishment of water user communities, policies implemented

Figure 6: Strategy framework used in uThukela final stakeholder workshop (September 2013) and example of a strategy build for one of the zones



Photos: S. Waldron

In all cases, the first purpose of the matrix was to assess the feasibility of the strategy by checking that the total requirements of all actions in terms of resources do not exceed the capacity of actors and implementing organizations. The second objective was to identify the potential contradictions or synergies between actions by comparing their impacts with the objectives of the strategy (formulated in the focal issues).

Simulation games

The role-playing-games developed in each case study (and described in details in section 4.1.2.2) were used in different ways during the strategy building:

- in Fogera, Rwenzori and IND the game was played with meso-scale stakeholders using a "business-as-usual" scenario to launch the discussion on actions, but the actions were not identified during the game session itself (Abrami and Cullen 2012; Hssenforder *et al.* 2013).
- in uThukela, 6 focus group sessions were organized to test the game with participants grouped per sector and zone. The test itself was followed by a collective discussion on INRM issues facing the area. Stakeholders identified possible solutions to the issues and the organizations responsible for implementing them. Solutions identified in these workshops were mainly of an institutional or behavioural (education & awareness) nature (Waldron 2013)

- In Rwenzori, a micro-game representing the situation at village level was also developed but the 35 games sessions at communities' level used the meso-scale game. These game sessions were specifically used to elicit the preferred actions of local NR users. Sub-sequent sessions allowed for the building of village strategies. (Hassenforder *et al.* 2012a; Kabaseke *et al.* 2013)

Figure 7: Role Playing Game simulation sessions
(clockwise from left to right Fogera, uThukela, Rwenzori, IND)



(Photos: E Hassenforder, S Waldron, M Diallo)

4.1.2.3 Technical tools for action specification, selection and integration

Technical tools developed under Afromaison Work Packages 3, 4 and 5 had three main components, described in detail in Lewis *et al.* (2014):

- Spatial planning –to understand the spatial relationships and integrate NRM across scales and sectors, including the use of ecosystem services mapping and assessment
- SLM interventions - identification and evaluation of appropriate technologies to improve livelihoods, sustainability and overall landscape functioning
- Economic tools to develop appropriate incentive systems to support implementation of the other identified interventions.

Spatial Planning

Spatial planning tools support INRM by addressing multiple stakeholders' objectives, and information on natural resources interdependencies and complexities (Ive and Cocks

1983; Bryan and Crossman 2008). These tools are used at different phases of spatial planning process to ensure sustainable use of the land and natural resources, by providing a framework for land-use planning. These tools may comprise of simple maps, drawings or simulation tools, or any other tools which provide insight into impacts of change at different spatial and temporal scales (Eikelboom and Janssen 2012). Spatial planning and related tools used in Afromaison are described in Lewis *et al.* (2014).

In Afromaison, selection and assessment of SLM interventions is an explicitly spatial process, requiring an understanding of the way that proposed interventions and their potential impacts are distributed in the landscape. Each case study was divided into management zones (see Table 1 in section 3.1.1) which reflected local understanding of landscape systems, and the different land management needs and options in different land units. The zones provide the base unit around which strategies were built. The basis for the zoning differed in each case study, depending on local priorities and issues. Topography was a key factor in most cases, as a major constraint on land use options, as well as encapsulating upstream – downstream relationships. Land tenure (for example in the uThukela case) and administrative divisions (for example in Oum Zessar) were also important, representing domains for implementation by different actors. These zones also formed the main spatial units around which the WAG boards were conceptualized, and the games explicitly considered the interactions between zones, in terms of physical flows of water and related sediments and nutrients, as well as flows of production, labour and profits.

Participatory spatial mapping was used to identify issues and areas for intervention, as part of the development of the simulation games or separately all CS (except Tunisia where extensive participatory mapping exercise were undertaken in previous project). This varied from an abstract conceptualization of the landscape as linked units (as in WAG), to accurate spatial representation of the area using satellite imagery. Stakeholders identified on the map the main issues in each area, and connections between zones, as input to identifying interventions and management strategies. Suitability mapping for specific interventions was explored, using GIS-based approaches, but was limited by availability of spatial data to describe constraints adequately at appropriate scales. Spatial impacts domains of interventions were analysed and described using two main approaches: mapping changes in ES provision, based primarily on changes in land cover (see Vrebos, 2014) and hydrological modelling of impacts of interventions on erosion, water availability and water quality.

ESS concepts were included in the process for identifying and selecting SLM interventions in the following ways:

- Assessment of ES values and benefits formed an integral part of the initial problem diagnosis for each case study (see above). ES concepts were used to explicitly link landscapes and livelihoods, describe the dependence of livelihoods on natural systems, and the potential trade-offs and threats to livelihoods from conversion or degradation of ecosystems
- Mapping and spatial analysis of the flow of ES benefits in terms of both supply and demand were used to prioritise areas for intervention and to identify the most appropriate options for each zone.
- Evaluation of interventions and strategies in terms of livelihood impacts (reflected as changes in provisioning ES); environmental impacts (reflected as changes in the overall provision of ES, and in the types of ES) and equity of interventions.

SLM Interventions

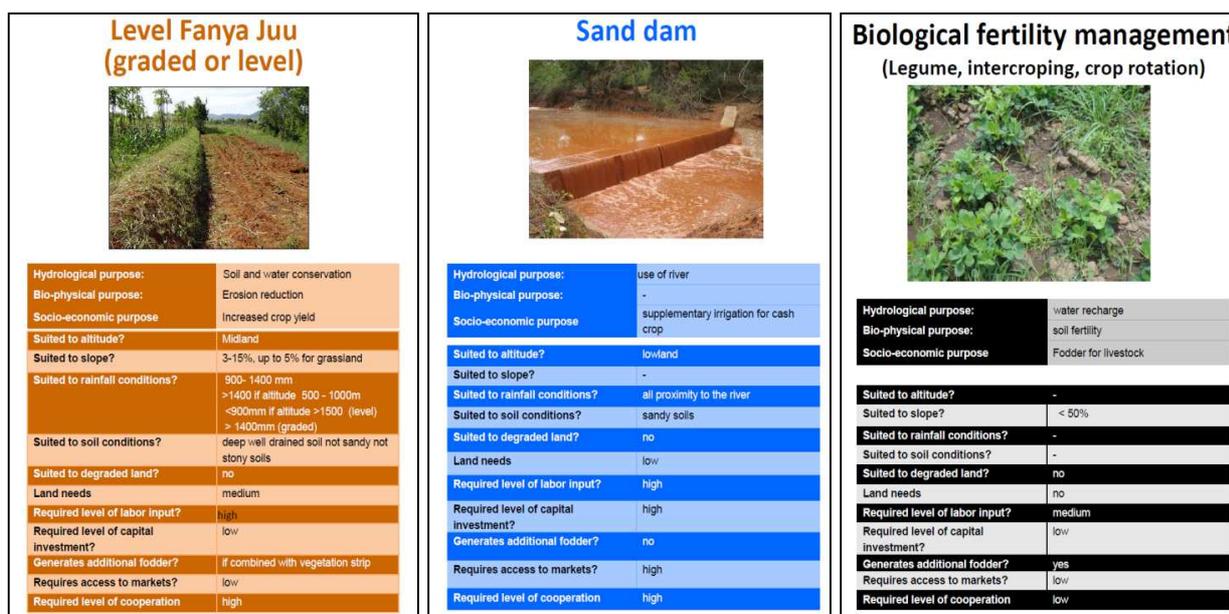
A wide range of technologies and interventions have been developed to improve land management and mitigate or prevent land degradation, drawing on both traditional and scientific knowledge.

There is a very extensive scientific literature on both research and implementation of SLM approaches, including manuals, handbooks, guidelines and databases categorizing SLM practices, and describing case studies. Available resources are reviewed in detail in (Johnston 2012). To expedite access to these resources for the case studies, and allow exploration of options to address specific NRM issues, a search tool was constructed for Afromaison which groups SLM interventions into 11 major categories according to purpose, and uses a faceted search to explore over 400 case studies compiled from the literature (available at <http://www.afromaison.net/>).

An integral part of the selection of practices was providing descriptions at appropriate level of detail to inform participatory discussions. A standardized format was developed for "intervention cards" to summarise the key points for intervention types, to facilitate discussion in workshops. Information fields were chosen to match the key criteria for selection of interventions in the case study. However, since the issues of concern differed, various versions of the practice cards were generated for each case study. Due to the iterative nature of the selection process, increasingly more detailed information is required as the process progresses through initial identification of required intervention types (e.g. rainwater harvesting), selection of specific technologies (e.g. ponds, zai pits) to detailed design for the particular context, taking account of soil type, topography and available resources. Detailed design is outside the scope of meso-scale projects such as Afromaison. It is, however, critical to the ultimate success of interventions that appropriate technical support is provided to communities at the stage of design and implementation).

A range of decision tools for selecting SLM interventions are available, including guided search tools (e.g. Schwilch *et al*, 2008), rapid appraisal frameworks (PROCA – <http://awm-solutions.iwmi.org/proca-and-gender.aspx>); decision trees (e.g. African Development Bank, 2008); and suitability mapping at a range of scales (e.g. Pfeifer, 2011; <http://www.seimapping.org/tagmi/index.php>). Available tools are described in detail in Johnston, 2012a.

Figure 8. Example of "interventions cards"



(source Pfeifer, C., and Notenbaert, A. (2011), <http://nilebdc.wikispaces.com/file/view/cards.pdf/265430290/cards.pdf>)

Experience in Afronaison suggests that the applicability of automated tools for selecting interventions at meso-scale is currently limited, for a number of reasons. First, most existing tools for suitability mapping have been developed at regional to national scales - e.g. AgWater Solutions database (2013); Kirby and Irvine (2013) - and are too "broad brush" to be relevant at meso-scale. While the structure and logic of the tools are theoretically transferable across scales, detailed data on constraining factors are rarely available. To be useful, decision support systems need to be able to predict the appropriate social and ecological niche for interventions, and move away from blanket recommendations. However, while a technology group may be broadly suitable over a range of conditions, the suitability of a particular instance or practice depends on specific design for local conditions. For example, contour bunds to reduce soil erosion are suitable in almost all conditions; but the exact form and layout of the bunds needs to be tailored to soil, slope and climate and may in fact vary within a single landscape. In addition, at the meso-scale, the aim is not to identify a single "best" solution, but a range of appropriate interventions from which land owners / managers can choose. The use of automated approaches may eliminate options that are of only moderate suitability in theoretical terms, but are a good fit to local preferences or to a broader catchment strategy.

Analysis of suitability also requires assessment of the likely environmental and livelihood impacts of SLM interventions. The primary focus was on assessing the impacts of SLM interventions as part of the overall INRM strategy, rather than in isolation. Three approaches were used in ex-ante assessment of impacts: qualitative assessment; semi-quantitative analysis of changes in ES provision; and quantitative modelling (mainly hydrological). These are described in more detail below (Chapter 5) and in Lewis *et al.* (2014).

Economic instruments

Economic instruments aim at providing incentives that will induce a change in the behaviour of people to improve the way they use and manage environment and natural resources. This is achieved by changing the extent to which people feel or experience the cost associated with the use of resources, or the consequences of their decisions about how to manage or protect the environment. An economic instrument, or combination of instruments, provides financial and other incentives so that users of natural resources pay for the social costs of that use, or benefit from the sustainable management of the resource and environment.

The effectiveness of an economic instrument in providing an incentive for improved environmental management is not only determined by the value of the benefit (incentive) it generates. There are a number of other factors that will also influence the effectiveness of an instrument, for example:

- Extent to which the instrument matches or complements the social, political and economic contexts;
- Extent to which the instrument incentivises an intervention that corresponds with the environmental challenge;
- Extent to which the incentive is recognised as meaningful or worthwhile by the agents or institutions whose behaviour or management approach is being targeted.

It is important that a conscious selection process is undertaken to ensure that the economic instrument is a good fit to the context. Poor 'context-instrument' matching could result in the selection of an ineffective instrument that does not result in the desired behaviour/management change by the target agents or institutions, or may even act as a perverse incentive and result in a change contrary to the desired response.

The Afronaison project developed two tools to support the choice and design of appropriate economic instruments. The Decision Support Tool (DST) was designed to

assist the process of context-instrument matching, and to support the selection of the economic instrument(s) that will have the greatest potential to provide effective incentives for interventions that result in improved environmental management. Fourteen economic instruments are included in this Decision Support Tool. While there are many other types of economic instruments, the 14 included in this DST were selected on the basis of their relevance to the INRM objectives of the Afromaison project³.

The Design Matrix (DeMax) tool was developed to inform (i) the assessment of the local potential to implement a selected economic instrument in a given context, (ii) key design considerations for the application of an economic instrument in a specific context, (iii) the evaluation of the likely impact and sustainability of the economic instrument in that context, and (iv) highlight potential flaws or barriers to the implementation of the selected economic instrument⁴.

Integration of expert tools

These components were combined in an integrated process, as follows:

- Spatial Planning was used to establish the spatial baseline across the meso-scale for which the INRM strategy is being developed, i.e. it is used to identify differentiation in the ecological, socio-economic and governance systems. This process involved the application of a range of spatial planning tools, selected according to the resources and capacity at the site. The outcome was a spatial framework reflecting the environmental challenges and management requirements across the meso-scale management area.
- SLM interventions were identified within the spatial framework developed through the spatial planning approach. Potential restoration, rehabilitation and adaptation interventions specific to the environmental challenges were identified and selected. The outcome of this process was an inventory of prioritised interventions to support ecological restoration and adaptation across the meso-scale target area.
- Economic tools and instruments were then applied to identify incentives for the uptake and implementation of the identified interventions for restoration and adaptation. A DST was applied to identify the economic instruments most likely to create meaningful incentives for the interventions within the local social, ecological, market and governance contexts of the meso-scale target area. The design of economic instruments to provide incentives for interventions also highlighted opportunities to cluster the implementation of interventions according to stakeholder groups, scale and spatial distribution, and timeframes. In some cases, a single set of economic instruments could be used to incentivize a range of SLM interventions in the same area or implemented by the same group. In other cases, a number of instruments each generating relatively small benefits may be stacked to collectively generate meaningful benefits that act as an effective incentive to trigger the required change in management. Instruments may also be stacked over time, for example an economic instrument that may not be sustainable in the long term (e.g. subsidies) can be used to generate short-term incentives to "kick-start" change.

³ This Decision Support Tool can be accessed on the Afromaison Project website at:

http://afromaison.net/index.php?option=com_content&view=article&id=72&Itemid=184

⁴ This Design Matrix can be accessed on the Afromaison Project website at:

http://afromaison.net/index.php?option=com_content&view=article&id=85&Itemid=185

The Decision Support Tool and the Design Matrix were developed within the Afromaison Project framework (<http://www.afromaison.net>) funded by the European Commission Seventh Research Framework (Grant agreement no 266379). These Tools are supported and developed by:

- Institute of Natural Resources (INR) (South Africa),
- InterSus Sustainability Services (Germany) (subcontractor on the Afromaison Project to ANTEA (Belgium)),
- University of Geneva/enviroSPACE (Switzerland)

The Tools were translated from English into French by: Ms Aida Zare (2iE in Burkina Faso)

4.1.2.4 Integrated processes for identification, selection and integration of options

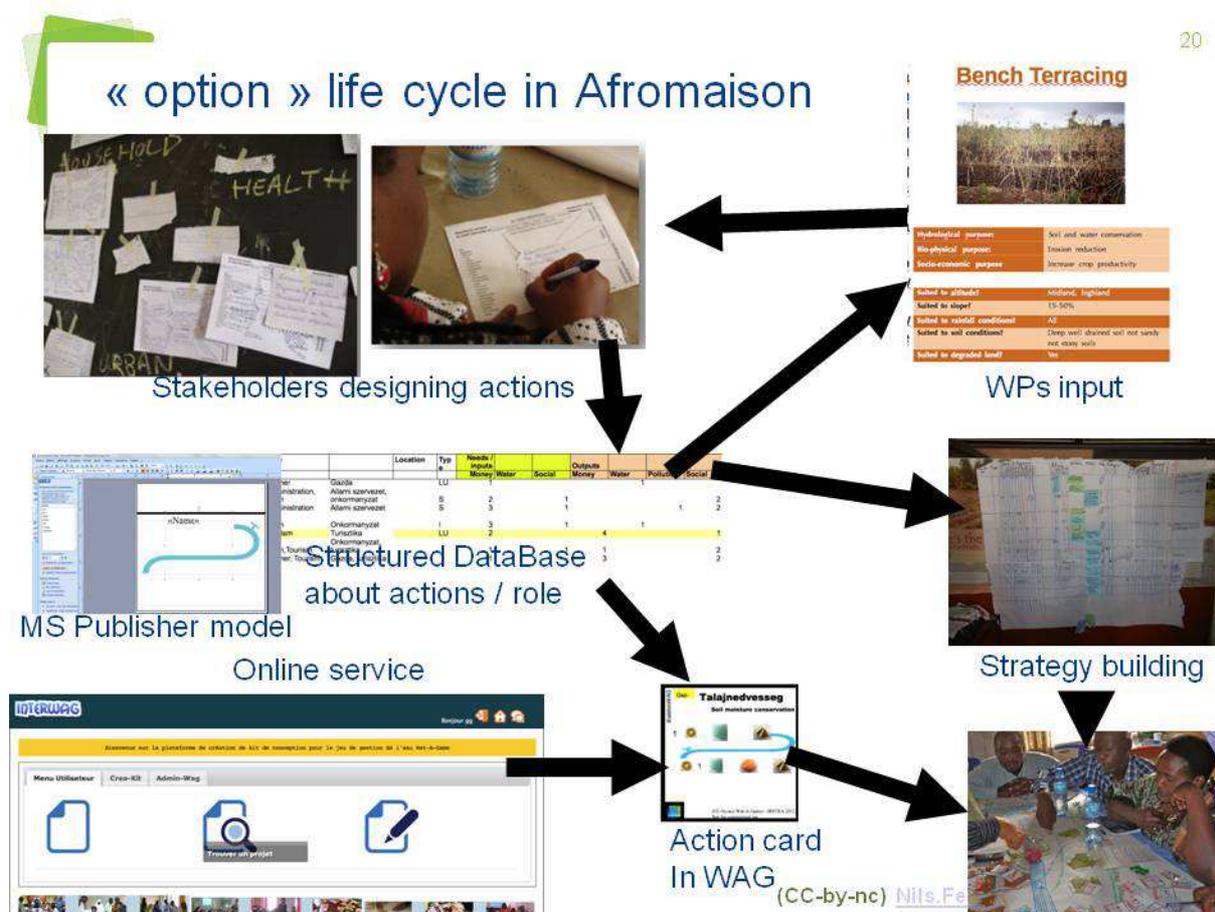
The participatory and expert tools were combined in various ways to formulate the INRM strategies in the case studies. Three aspects can particularly be highlighted from the analysis of the case study processes: the iterative nature of the option selection process, the approaches used to integrate scientific and traditional knowledge, and the various ways of mobilizing stakeholders from different levels and sectors of intervention.

Iterative nature of option selection process

The selection of management options as part of an INRM strategy is inherently iterative, where interventions are identified and progressively refined as their relationship to other parts of the strategy become clearer. At the start of the process there was often confusion between issues and actions, probably because stakeholders did not really know how to address the issues. As strategy formulation proceeded, identified interventions were revisited taking into consideration interactions and interdependencies, which may be spatial, temporal or socio-economic. The process of strategy formulation aimed at explicitly considering these interactions, as well as spatial domains for identified interventions; their relative timing; and the actors responsible for undertaking and/ or supporting implementation. In the strategy formulation workshops in each case study, strategy integration matrices were drawn up designating proposed interventions by management zone as short, medium and long-term; and assigning responsibility to particular actors (see Figure 5 for the example of Rwenzori). Timelines and grouping of actions revealed the need for precursor activities, staging or grouping of complementary activities, and resulted in revision of priorities and identification of new options.

Figure 9 illustrates this iterative nature of the process by showing how an option evolves as the strategy formulation proceeds from the initial identification and specification by stakeholders using in some cases inputs from expert analysis, through the structured database that can be enriched by additional inputs from experts, to the strategic integration matrix, and how the option database can be simplified to generate the activity cards used in the role-playing game used to assess the strategy.

Figure 9 : Option life cycle in Afromaison



(source N. Ferrand)

Integration of scientific and traditional knowledge

As presented above, the case study teams combined local and international expertise, using a mixture of participatory discussion and technical inputs to identify relevant interventions for their specific concerns. The combination of local and scientific knowledge is a key component of the Afromaison approach. The role of local experts and stakeholders is to provide historical context and knowledge of previous management successes and failures; insights in the dynamics of the system; assess local feasibility, acceptance and preferences; and highlight pressures and potential conflict. The role of scientific and technical inputs is to provide advice on technologies and approaches not currently used in the area; identify links and interdependencies that may not be obvious at local level; and provide predictive capacity based on experience in other areas.

Identification of options for SLM thus drew on local knowledge and experience; technical/scientific inputs (based on international scientific literature and expertise); and participatory brainstorming and exploration of options. These approaches were used in different ways and combinations in each case study, for example:

- Local knowledge:** In the Inner Niger Delta, the identification of local strategies for restoration and adaptation was carried out through a series of focus groups with different occupational groups (farmers, fishers, herders) in three communes. During the focus group discussions, stakeholders identified the problems encountered, their causes, the potential restoration strategies, the application domain, results and

technical implementation issues (See Zare, 2013 for a full description). These options formed the basis from which the strategies were formulated by meso-scale stakeholders during three workshops. Experts from the international research team provided additional scientific inputs, especially on potential economic instruments to support implementation of chosen technical options.

- **Participatory exploration of options:** In Rwenzori, an initial list of options for SLM interventions was identified during the first participatory workshop. Due to its early timing, results of expert analysis of interventions were not yet available for this workshop. The identification and specification of options further evolved within the framework of developing and playing the participatory simulation game Mpan'game, with meso-scale stakeholders and more importantly with NR users at village level. Potential SLM interventions were built into the game in an iterative way, in response to options proposed to address issues identified during the game sessions. Following the Mpan'game sessions and discussion, around 20 SLM practices were selected for further investigation and inclusion in the final strategies. In Rwenzori, expert analyses of options (ES mapping, identification of economic instruments, database of SLM interventions) were conducted as separate processes and their results not really integrated in the strategy formulation but the processes was better integrated in other CS (uThukela, IND, Oum Zessar)
- **Historical experience:** In Oum Zessar, a program of land and water management has been underway since the 1980s, drawing on historical experience with traditional water management methods (*jessour* and *tabia*). These structures, which retain water and sediment during storm events, have been rehabilitated and extended to new areas; and combined with new approaches using gabions and slotted pipes to enhance groundwater recharge (OSS 2014). The results of this analysis as well as the outcomes of the ecosystem services mapping and expert selection of economic instruments were presented to stakeholders during workshops although lack of detailed monitoring of the workshop does allow understanding how these information was used to select options and build strategy.
- **Expert analysis combined with participatory exploration:**

In Fogera, researchers identified a long list of 81 potential SLM practices to address the range of land degradation and production issues in the Blue Nile Basin. These were described and grouped in terms of their purpose (biophysical, hydrological and socio-economic), and the physical, socio-economic and institutional conditions needed for implementation, and screened using the PROCA tool (<http://awm-solutions.iwmi.org/proca-and-gender.aspx>) to a short-list of 35 practices relevant for the region, which were explored in more detail with stakeholder groups (Pfeifer and Habtemichael 2011). Information on practices was summarized in the form of coloured cards ("Happy strategy" cards). During the first Afromaison participatory workshop, stakeholders independently listed "practices" that they thought were needed to address the case study focal issue. They were then introduced with the results of the expert analysis through the "Happy strategy cards" and were able to pick the ones they found most appropriate to add to their initial option list. On the other hand, the participatory formulation of the strategy did not make use of the results of the analysis on economic instruments.

In uThukela the identification and specification of options was largely based on an in-depth scientific analysis tapping from international and local expertise and including ESS analysis and mapping (Quayle and Pringle 2013), economic instruments analysis (Lewis 2013), and analysis of SLM interventions (INR/IWMI 2013). Local stakeholders' perspectives on possible solutions to the identified environmental problems were elicited mainly during the focus group discussions organized as part of the game-modelling process and during the four economic instruments workshops. During the final stakeholder workshop, the results of this expert analysis were presented to the meso-level stakeholders before the participatory strategy building exercise.

Size and nature of stakeholders' grouping

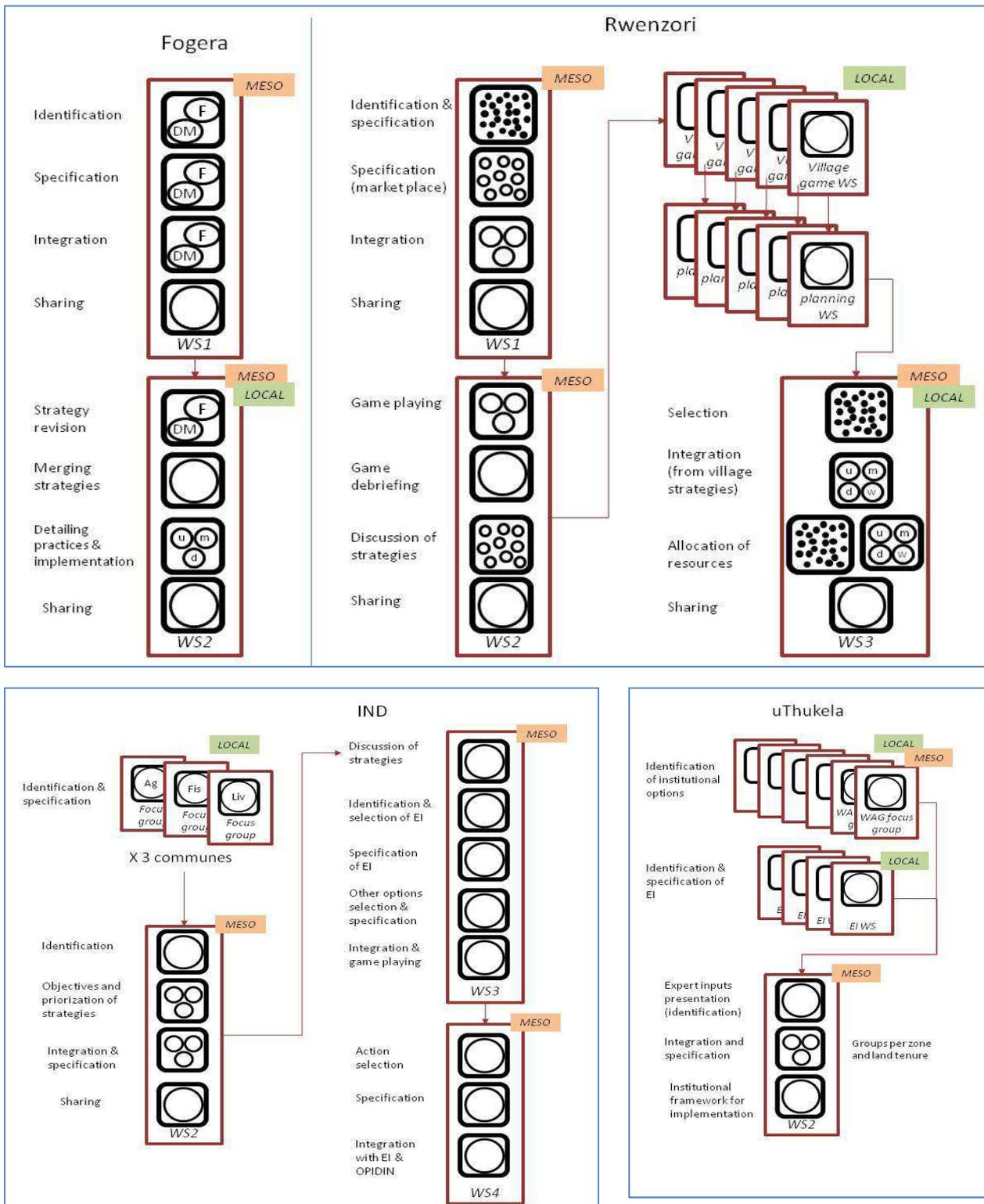
During the strategy formulation process, size and nature of stakeholders groups varied across cases and phases of the process.

Figure 10 illustrates this diversity of format for four of the case studies. The first distinction concerns the co-presence of local and meso-scale stakeholders:

- For the identification and specification of actions, local and meso-scale stakeholders were always involved separately, either in separate workshops (IND, uThukela, Rwenzori, Oum Zessar) or in separate groups in the same workshop (Fogera). The advantage of this separation is that it offered a larger space of expression for local stakeholders, in particular lay users of natural resources, who might have experienced difficulties in voicing their perspectives in a mix group with more powerful participants.
- For the integration of actions into strategies, local and meso stakeholders worked in separate workshops in Rwenzori, in separate groups in the same workshop and then together in another workshop in Fogera. In the other cases only meso-scale stakeholders participated to the strategy building, partly because of time constraints. The examples of Rwenzori and Fogera show that despite the apparent cognitive difficulty of the integration process, local stakeholders were able to carry it out.

Apart from their level of intervention, stakeholders were also grouped according to their sector (e.g. in IND focus groups of fishermen, farmers and livestock breeders proposed options for the strategy; and in uThukela WAG workshops were organized according to stakeholders' sector of activities), or their space of intervention (e.g. in Oum Zessar and in Fogera, groups of stakeholders from the same zone developed a specific strategy for their zone). The detailed process followed in each case is described in the next section.

Figure 10. Size and nature of the stakeholders grouping in strategy building process



4.2 The outcomes of the process: integrated plans

4.2.1 The contents of the integrated plans

Four main dimensions structure the strategies in the case studies: the spatial structure of the CS site (where will the actions be implemented?), the intervention sector of actions (which sector is targeted?), the type of actions (see Figure 11 : Targeted sectors in the case study strategies and Figure 12 : Distribution of action types in the case study strategies) and the time frames (when will the actions be implemented?), with different emphasizes according to CS (see Table 4 : Strategy structure: hierarchy of criteria per case study and Table 5 : Spatial and time structure and intervention domains of integrated strategies developed in the case studies):

- In uThukela and Fogera, priority was given to the spatial structure. In uThukela three different strategies were developed for each zone and sub-zones, sub-zones being defined on the basis of land tenure (private versus communal). In Fogera, one common strategy was defined but the building process emphasized the spatial integration of actions.
- In Oum Zessar, the strategy is presented according to the main intervention sectors (thematic dimensions proposed by the TWGs), but the building process was structured by zone defined as sub-basin along an upstream/downstream divide also corresponding to administrative management unit.
- In Rwenzori the strategy is presented according to the level of implementation of actions (household, community, and region). However, the spatial dimension was an important aspect of the building process, with local strategies developed by 30 local communities, and strategies are also specified by zone (defined as sub-basin unit along a upstream-downstream divide).
- IND is the case where the spatial structure is the least prominent: although actions were initially identified for three different "cercles" characterized by different balances of the three occupational sectors (agriculture, fishery and livestock breeding), the strategies do not mention any difference of implementation of actions according to places.

Table 4 : Strategy structure: hierarchy of criteria per case study

Case study	1 st criterion	2 nd criterion	3 rd criterion
Fogera	Zone	Time frame	
IND	Environmental stake / drivers	Thematic sectors (fishing, livestock breeding, agriculture)	Time frame
Oum Zessar	Intervention sector	Zone	
Rwenzori	Implementation level (household, community, region)	Time frame	Zone (location of actions)
uThukela	Zone	Environmental stake	Time frame

Coordination between zones has been unequally considered during the building of the plan but the test of strategies using role-playing games permitted to partially address this question. In **uThukela**, plans were specified by management zones (WHS, buffer zone, other with private and communal tenure) and the interactions between activities in adjacent zone (such as convergence, incompatibilities, and continuities) were not considered even if the need to provide a global plan for some intervention (like fire

management) was mentioned. Indeed, the(re)-integration of the different management areas inherited from the political history is a particularly crucial and challenging issue in South Africa. The strategy stresses the need to build an adequate governance structure linking the different zones for the implementation of the strategies: various options were proposed and the game permitted to test the different coordination modes. Yet, management strategy remains defined at zone level. In **Fogera** in the first stage stakeholders from each zone (specify) selected the interventions they thought appropriate for each zone without considering the potential impacts on other parts of the landscape and the global requirements for implementation; in a second stage they discussed the potential impacts interventions to other parts of the landscape, with the RPG support.

The temporal structure of the strategies reveals a general problem of time prioritization of actions:

- In Oum Zessar and IND there is no time prioritization at all, as most actions are within a 2 years' time frame. This can be related to the unstable political situations, where people have difficulties to project themselves in a longer term.
- In uThukela, although actions are apparently prioritized in time, in reality most actions are situated at the same time with more complex ones postponed to later stages. Similarly, there is a strong focus on the short term in Rwenzori, where smallholders, who participated actively in the process, need to see quick results.
- Fogera seems to be the case where time prioritization of actions was more carefully considered: indeed in the elaboration of the final common strategy the facilitators asked participants to choose a maximum of 3 actions per zone and time horizon.

Table 5 : Spatial and time structure and intervention domains of integrated strategies developed in the case studies

Case studies	Spatial structure	Time frames	Intervention domains
Fogera	<p>3 zones: upper, middle and lower landscape</p> <p>Farmers selected a lot of actions to be implemented in the uplands</p> <p>The decision-makers strategy shows little differences between spatial zones.</p> <p>The common strategy shows a balance between the three zones (due to the building process).</p>	<p>3 time horizons: short, middle and long term were considered (though specific time frames were not defined)</p> <p>The farmers' group tended towards defining unrealistic time frame (mostly short term actions).</p> <p>The decision-makers' strategy displays limited differences between short, mid and long term actions.</p> <p>The common strategy displays a balance between time frames (due to the building process).</p>	<p>Farmers' strategy : 5 domains</p> <ul style="list-style-type: none"> - Policy/institutions - Soil fertility and conservation - Livestock management - Water conservation - Tree conservation <p>Decision-makers' strategy: 5 domains</p> <ul style="list-style-type: none"> - INRM - Institutions - Socio-economy - Technology - Cross sectors <p>Common strategy includes 6 domains: agriculture, conservation, water; institution, infrastructures/equipment, technologies/practices</p>
Inner Niger Delta	<p>3 "cercles", each one corresponding to the predominance of one natural resource (grazing land, fisheries, cropping land)</p>	<p>3 time horizons collectively defined: short term (1 to 3 years), midterm (3 to 5 years), and long term (5 to 7 years)</p> <p>Implementation of proposed and deadline of the strategy objectives to be reached are mostly within a time frame of 5 years; difficulties to envision longer term actions, probably because of the unstable political situation</p>	<p>3 complementary strategies at the IND scale pursuing 3 objectives:</p> <ul style="list-style-type: none"> - Ensuring a better access and control over water resources - Adapting to and mitigating impacts of climate change (agricultural water management and diversification of livelihoods; agricultural storage and processing facilities and transport infrastructures; land use management and reforestation) - Strengthening the technical and organizational capacity of actors (technical & managerial training; support to community-based organizations)

Case studies	Spatial structure	Time frames	Intervention domains
Oum Zessar	3 sub-basins (upstream – “djebel”, mid-stream “piémont”, and low plain “Jeffara”) corresponding also to the three administrative sub-units (“délégations”) of Sidi Makhlouf, Medenine and Beni Khedache	Duration of actions is specified in the action sheets, but there is no synthetic calendar specifying the different time horizons. Most of actions are planned within less than 2 years, except for SWC works which required more time to implement	4 domains: <ul style="list-style-type: none"> - soil and water conservation, - development of rainfed agriculture and promotion of agricultural production, - road infrastructures and social equipment, - development of the economic fabric and income generating activities
Rwenzori	3 zones: upstream, midstream, downstream and intermediary	2 time horizons: now and later	10 domains, which can be grouped into 4 main categories: <ul style="list-style-type: none"> - Resources: energy, water, conservation - Economic activities: agriculture, tourism, market/economic - Community development: health, livelihoods - Policy - Infrastructure 3 dominant domains: policy, agriculture, conservation
uThukela	3 zones, with sub-zones: <ul style="list-style-type: none"> - World heritage site - Buffer zone <ul style="list-style-type: none"> ▪ with private tenure (commercial farming) ▪ with communal tenure (subsistence farming) - Outside areas <ul style="list-style-type: none"> ▪ with private tenure ▪ with communal tenure 	3 time horizons: short term, medium term, long term Strong focus on the short term	Strategy structured around major environmental stakes: <ul style="list-style-type: none"> - control of alien species, - grazing and fire management, - wetland rehabilitation and improved management, - protection of high value ecosystems, - regulation of water use, - conservation agriculture + coordination between management zone and governance structure for plan implementation

Box 1 : Types of interventions - definition and examples

The Millenium Ecosystem Assessment (MEA) identified six main response types used in ecosystem management (Chambers and Toth 2005):

Institutions (both formal and informal) are not responses per se, but create the framework for management responses.

Legal responses encompass domestic laws and environmental regulations (including regulatory mechanisms such as EIA) as well as international law, treaties and agreements (such as the Ramsar Convention). These may operate both within and outside the environmental sector – for example, trade regulations can have a significant impact on environmental outcomes. The efficacy of legal instruments depends heavily on effective enforcement systems.

Economic interventions are an important way to regulate the use and overuse of ecological goods and services from wetlands. Options include command and control responses (such as zoning and quota systems for controlling use of ecosystem services); incentive based interventions through taxes and subsidies or payment for ecosystem services; tradable resource use rights or emission permits; and voluntary measures such as eco-labelling and codes of practice. Financial and monetary measures at different levels can be used to facilitate access to funds for wetland programs; for example: microcredit; government loans and funds for specific purposes; public financing for wetland programs; and at the international level, debt swaps for environmental outcomes. As with legal instruments, measures outside the environment sector can significantly affect outcomes in wetlands – for example, import and export restrictions or tariffs can affect the viability of different wetland uses.

Social and behavioural interventions include public education and awareness campaigns, empowerment of indigenous and local communities, and civil society actions including civil disobedience and protest.

Technological responses encompass a wide variety of hardware (products, devices, tools) and software (procedures, processes, practices) to mitigate human effects on ecosystems by allowing less dependence, lowering anthropogenic impact, or helping to restore degraded ecosystems.

Cognitive responses rely on changing behaviour through increasing knowledge. Options include improving knowledge acquisition and use (for example, through monitoring programs), adaptive management approaches and legitimization and acceptance of both traditional and scientific knowledge.

Source: (Johnston 2012)

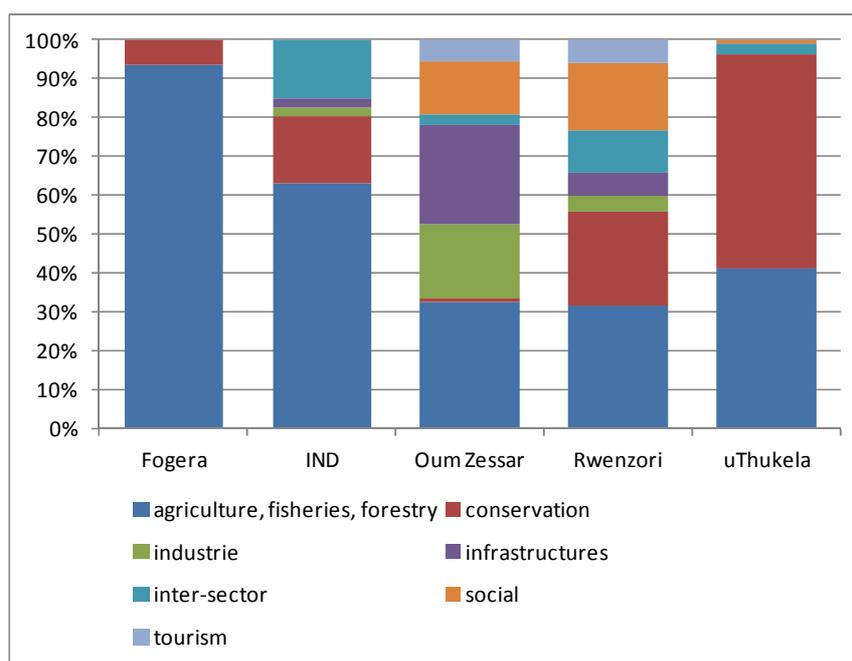
In analyzing the strategies formulated in Afromaison case studies we only retain 5 types by merging institutional and legal actions.

Table 6 : Examples of actions per type of intervention and sector

	Cognitive	Economic	Legal	Social	Technological
Agriculture, forestry and fishing	Creation of an agricultural extension center (Oum Zessar)	Voluntary environmental agreements to promote conservation agriculture (uThukela)	Creation of agricultural development association (Oum Zessar)	Continuous awareness creation and development of bylaws for livestock management (Fogera)	Introduction of conservation farming techniques (Rwenzori)
Conservation	Environmental monitoring (Rwenzori)	Voluntary environmental agreements for biodiversity management (IND)	Control water abstraction (uThukela)	Formulate functional environmental committees (Rwenzori)	Rehabilitation of degraded land (Fogera)
Industry	Study on natural resources for building materials (Oum Zessar)	Agro-industry development (Oum Zessar)	Authorized sand mining (Rwenzori)	-	Product processing and storage units (IND, Oum Zessar)
Infrastructures	Creation of a geological institute (Oum Zessar)	Raising of the water tank subsidy from 25 to 60% (Oum Zessar)	-	-	Building of transport infrastructures for opening up and improving access to market (IND, Oum Zessar)
Inter-sector	Education, training and awareness (uThukela)	Mobilise the community to initiate income generating activities (Rwenzori)	Better adaptation of modern law texts to customary law (IND)	Constitute a lobby of IND users to influence upstream water management (Office du Niger, dams) (IND)	Water harvesting (Rwenzori)
Social	Creation of a public library (Oum Zessar)	-	Policies on family planning - population growth control (Rwenzori)	Family planning at household level (Rwenzori)	ECOSAN toilets (Rwenzori)
Tourism	Archeological study (Oum Zessar)	Creation of a touristic tour (Oum Zessar)	-	-	Creation of a camping site (Rwenzori)

The range of intervention sectors is very large in two of the case studies (Oum Zessar, Rwenzori), where the strategies are more oriented towards sustainable livelihoods than towards natural resources management per se (Figure 11). On the contrary, uThukela and Fogera strategies focus more on natural resources stakes in line with on-going political processes related to natural resources management in the areas⁵ (Environmental Management framework in South Africa, government campaign on sustainable land management in Ethiopia – see Table 7 : Linkages between Afromaison process and existing political and institutional processes in the case studies). As a result, interventions are targeted mainly towards agriculture and conservation.

Figure 11 : Targeted sectors in the case study strategies



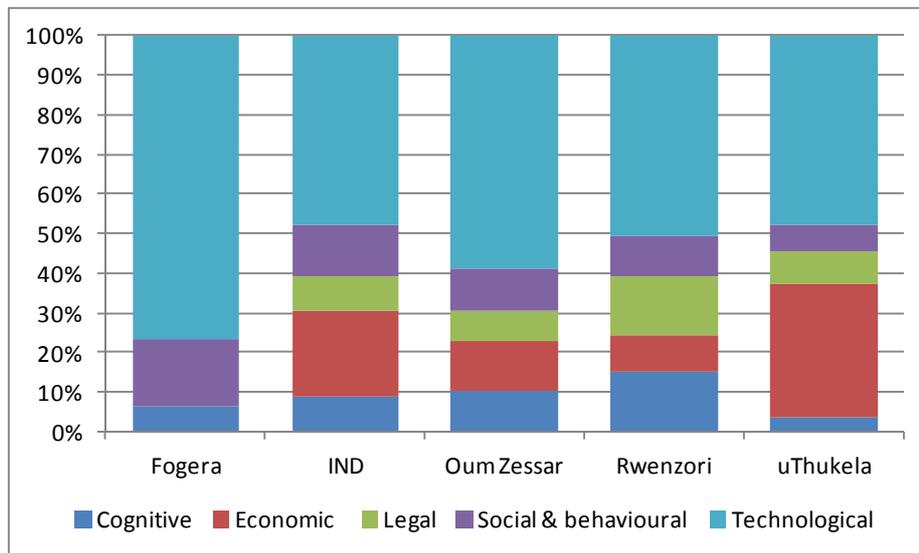
In all cases technological actions to improve agricultural production and/or restore degraded ecosystems, form the core of the strategies (Figure 12). **Only in uThukela and IND**, the economic instruments selected were fully integrated within the strategy development process: tools developed under WP4 to select the most appropriate economic instruments (DST) and assess their potential impacts (DeMax) were used with stakeholders, as part of the strategy development workshops, under the supervision of economists able to introduce the instruments to participants. However this leads to a somehow artificial “inflation” of economic instruments in the strategy, which are not sufficiently tailored to the local circumstances. In other cases, those tools were used in a separate process, involving mostly experts from the research team and no or few stakeholders. As a result, no, or very few, economic instrument was selected as part of the strategy in these cases.

In Rwenzori, actions related to governance and legal issues hold an important place in the strategy. In IND, issues related to the enforcement of formal laws and regulations by traditional leaders and of corruption were raised during the strategy development process, although no concrete solution was proposed to address them. In uThukela most

⁵ In Fogera, although initial strategies developed by stakeholder groups had a broader scope it was decided to re-focus the strategy during the second stakeholder workshop so as to be able to define it more precisely and to develop an implementation plan. After a group discussion stakeholders chose to focus on grazing management.

of the governance-related interventions concern the areas under communal tenure and subsistence agriculture, where natural resources management tend to fall into a void between dwindling customary management by traditional authorities and more formal but under-resourced, law-driven management by local governments.

Figure 12 : Distribution of action types in the case study strategies



In Oum Zessar, the strategy includes mostly action types that are usually found in rural development plans, for example a high number of infrastructure developments (especially roads) and of social equipment (for health and education). Although it reflects a need expressed by stakeholders, it can also be explained by the important role played by CRDA (the administration in charge of agriculture and rural development at regional level) in the strategy building process. In the context of the Tunisian revolution, one could have expected a higher concern for governance issues, for example the creation or strengthening of civil society organizations in charge of NRM or procedures allowing for participation of local citizens to INRM (for example in the maintenance of infrastructure), but this was not the case. In Fogera, although there is no institutional action included in the strategy, these aspects were thoroughly discussed during the implementation phase (see section 4.1.4).

Cognitive actions are present in all strategies, Rwenzori displaying the highest share and uThukela the smallest. In IND, there is even a specific strategy targeted towards capacity building of NR users. This may reflect the particular concern of the persons who lead the strategy building process in this case.

In conclusion, it seems that the personal sensitivity and interests of the facilitator(s) of the strategy-building process and the nature of the participants were instrumental in the general orientation of the strategy. This emphasizes the importance of carefully planned strategy-building process and a balanced and equitable participation of all stakeholders, especially among the natural resources users, to avoid bias in the strategy formulation.

Table 7 : Linkages between Afromaison process and existing political and institutional processes in the case studies

Case study	Link with existing institutional and political processes
Fogera	<p>In Fogera, at the time of Afromaison project implementation, there was an on-going government sustainable land management campaign, where farmers were requested to implement some SWC interventions. This compulsory work conflicted with farming activities and has impinged on farmers' participation to Afromaison meetings. In the same time it permitted to bypass the government in stakeholders' selection in the last workshop as their usual "partners" were busy with the campaign. Participants to the workshop were thus non participant to the campaign or even opponent which permitted to understand their perspective. Opponent to the campaign also clearly influenced the narrowed focal issue chosen by stakeholders for the strategy. Indeed grazing management had become a political issue due to the need to meet national NRM objectives. Decision-makers at woreda and regional levels were faced with top-down command to address this issue.</p>
IND	<p>The main planning process for INRM is the Strategic Development Plan for Inner Niger Delta (PDD DIN). For the moment it includes a shared diagnosis and vision that the Afromaison team used, but no operational plans. The government administration in charge of its implementation also lacks adequate operational capacity and resources. WI that led the Afromaison process in IND advocates for including Afromaison strategies into the future IWRM plan for IND. Due to political unrest in the area, participation of some decision-makers to the Afromaison process was difficult and civil society was underrepresented</p>
Oum Zessar	<p>The list of actions proposed by stakeholders was compared to the different programs and projects in the area (national government budget, regional development program, NRM project, integrated development project, five-year development plan). However, there is no reference in the strategy report to pre-existing procedures, which can be justified given the rapidly changing Tunisian institutions.</p>
Rwenzori	<p>The CS team engaged with the Rwenzori Regional Development Framework (RRDF) that gathers regional civil society organizations to provide an overarching guide to development efforts in the region. Two Lead organizations at least of the 4 pillars of RRDF participated to the Afromaison process (option selection, strategy building, and implementation plan). The strategy developed through the Afromaison process was endorsed officially by the RRDF whose members committed to its implementation.</p> <p>The social simulation tool Mpan'game was recognized by several high level stakeholders (the King, member of parliament, minister, executive officers of district council) who have the capacity to influence further INRM process. (impact on strategy choice ?)</p>
uThukela	<p>The local team initially intended to embed the Afromaison process into the Environmental Management Framework (EMF), a new compulsory process at district level in South Africa. Baseline information and outcomes of stakeholder consultation were provided by the Afromaison team to the consulting company and District Municipality representatives in charge of EMF. The collaboration also included a cross participation to stakeholder meetings organized by both teams and the inclusion of the Afromaison strategy within the EMF draft document for comments. However it was difficult to fully integrate the two processes due to different agendas and calendars. The EMF process has principally a spatial focus and makes a large use of maps which appears in the way the strategy was defined</p>

4.2.2 *Only incipient implementation plans*

At the moment⁶, only the IND CST proposed constructed narratives to communicate on the strategies. The IND CSR provided detailed narratives of the 3 strategies, starting with the rational (main problems and drivers of the current situation), requirements for the strategy to be successful (insisting on governance aspects), and summarizing content stressing the links between various actions. In uThukela the narrative provided was not really specific: if it insisted on ES approach to integrate across natural systems and the need of governance framework for integration, the strategies themselves are only presented as a collection of actions. The other CS did not present any kind of narrative or description of their strategies.

An implementation plan aims to detail the tasks (of different types such as training, political mobilization, administrative procedure etc), the responsibility for each of these tasks and the interactions / timing of each tasks. The AfM OF proposed to develop this implementation framework collectively as a way to identify barriers to implementation and foster further engagement and commitments of actors.

Detailed implementation could not be developed in the CS for lack of time on one hand but also concrete alternatives of funding to be mobilized. Only three of them did actually try and discuss how the strategy could concretely be implemented:

- In **Oum Zessar**, an expert-based work permitted a global estimation of the cost for each intervention of the strategy as well as recommendations concerning the institutional framework necessary for the integrated plan implementation (Sghaier and al, 2014).
- In **Fogera/Blue Nile**, the outcome included an "implementation plan" for the next year in 3 pilot site defining some responsibilities, task and partnerships that were discussed during the last ½ day of 3rd workshop. A committee was formed, mainly from research partners, district and local government to support implementation. Non research actors committed by offering labour and support from government agencies, but needed financial support for fencing, equipment, meetings etc. IWMI / ILRI committed to support proposal writing and funds seeking but in project-based functioning institutions, institutional support is missing to pursue this task.
- In **Rwenzori**, two levels of implementation planning were discussed. The last workshop session carried out in each *community* included an implementation planning process. Communities members selected in their community plan (which resulted from an adaptation from the original plan according to meso scale plan) some actions to immediately implement and discuss responsibilities task and timing for success; At *meso-scale* level, each "implementation sheet" was used to specify the resources needed, task and responsibilities. This information was aggregated for in a global tab.

In the two other CS they were no time nor resources to develop any discussion concerning implementation. In uThukela stakeholders expressed a concern in the last workshop that the strategy will not be implemented. Different reasons were mentioned and the final synthesis made some recommendation and/or amendment to the strategy to address these issues.

⁶ The narrative for the Rwenzori strategy was being elaborated at the time of the elaboration of this report

4.3 Conclusion on the implementation of the operational framework

The operational framework has proved valuable to build integrated plans at meso-scale in a truly participatory manner. Consultation and participation was at the heart of the process and in each case study a large variety of actors (farmers and resources users, decision makers, technicians, experts and scientists) have been engaged both in the different phases of plan building, from the diagnostic to its evaluation.

The process mobilized a large variability of approach and tools which provided providing different and complementary perspectives; Tools had a double function of information transmission and/or presentation as well as a support to exchanges perspectives and knowledge. In the process they had a role of boundaries tools.

Although the AfM-OF process is presented as a linear process implementation have underlined its iterative features : The different steps allowed for sharing of the diagnostic and understanding of the complex functioning of the landscape and social interactions which progressively led to better specification of issues and options proposals, whose discussions increased both understanding of issues and functioning.

Yet it was not possible to develop the last part of the framework that is the development of the implementation plans of the strategies which could have help for the operationalization of the strategies.

5 Monitoring and assessment in a process oriented approach using a complex system background

They were no unified definition of what would be a 'good strategy' among the Afromaison team: the significance of "good strategies" was highly variable between the team reflecting the variability of perceptions, understanding but also theoretical background. Definition could use one or various types of definition such as:

- **Procedural definition:** definition based on how a strategy should be built such as inclusiveness (of actors / stakes / resources / levels); incorporating complexity and uncertainty, wide consultation basis, decision making based on adequate tools, explicitly addressing the linkages and relationships between stakes / resources / levels
- **Pragmatic definition:** cost-efficiency of the strategy, cost efficiency of the planning process
- **Content-based definition:** plan with appropriate time frame, without unbalance and incoherencies, including compromise between traditional rules and new rules, context specific plans, with measurable outcomes or including indicators, clear goals and milestones; alignment with national priorities and structures or alignment to resources, including a detailed implementation plan or addressing responsibilities, task and resources to mobilize etc
- **Outcomes based definition:** improved livelihood and environmental quality
- **Normative based definition:** includes good governance principles, enhance institutional capacitating; optimization of use for certain users groups; enhance self organizing skills and contribute to enhance adaptive institutions of etc

Beyond the variability of these perceptions lays the traditional questions related to monitoring and assessment: the need to clarify and specify the objectives of the intervention and the related criteria for assessment. For example what is an appropriate time frame? Does it vary following the context? What stakeholders grouping method can we use to define inclusiveness? Choosing indicators, the methods to measure them and to assess progress remains an issue for many of these characteristics. The Afromaison process have tried to clarify some of these issues and proposed an organized framework for monitoring and evaluation which includes the monitoring of the process itself and of the assessment of the strategies.

5.1 The challenges of monitoring and evaluation in a complex system perspective

5.1.1 The role of evaluation

Evaluation of INRM strategies in Afromaison has two related roles: to validate the strategies formulated for each case study; and to provide the basis for adaptive management. The validity of a strategy can be assessed in terms of the likely change towards the shared vision around which the strategy was formulated. The aim is to account for both intended and unintended consequences of the proposed strategies, taking into consideration the different dimensions of INRM: environmental (impacts on

the dynamics of natural processes); socio-political (impact on the relationships between actors) and the socio-economic (economic and livelihood impacts for different types of actors). Establishing agreed criteria for success, and indicators and methods by which these criteria can be described and tracked, provides a platform for on-going monitoring and adjustment of management strategies within an adaptive management framework (Allan and Stankey 2009).

Since Afromaison did not progress to implementation of strategies, evaluation was necessarily restricted to **ex-ante** and **procedural assessments**. Ex-ante evaluation is essentially predictive, to assess potential outcomes of changed management strategies before they are implemented. Procedural assessments, in contrast, are concerned with contemporaneously observing and qualifying the impacts of the process of strategy formulation, particularly the impacts of multi-level participatory processes on the way that stakeholders interact with the system.

The traditional ex-ante evaluation models grounded on the rationalist and reductionist perspective put emphasis on effectiveness criteria and a set of quantifiable policy targets and outcomes expressed as clear measurable goals (Faber and Alkemade 2011). By a complexity perspective on social-ecological systems precludes the use of a rationalist approach (Gunn and Noble 2011) including on evaluation approach and assessment criteria. As complex socio-ecosystems are understood as both uncertain and pluralistic (Foxon *et al.* 2008) evaluation of impacts value lies in the evaluation process ability to inform debate and critical reflection (Adelle and Weiland 2012), with space for iterative and collective learning and experimentation. Thus it is important to add to the ex-ante assessment of outcomes an on-going assessment of the process itself.

The Afromaison project couples an ex-ante strategy assessment based on social simulation (role playing games) with an on-going assessment of the planning processes, complemented by more traditional assessments of impacts. It is assumed that the process itself of plan building and assessment directly impacts the institutions and organizations involved. The assessment is meant not to provide definitive answers but to provide insights and enrich the technical-political debate leading to decision making as well inform about possible institutional and/or organizational changes. For these objectives, the assessment framework lies combines different methods, some explicitly linked to complex systems and others more connected to traditional methods, with a clear acknowledgement of the limits of the different types of assessment.

The different methods aim to provide answer to the following questions:

- What are the impacts of the strategy on a given sub-part of the system (specific ecological aspects, livelihoods, etc) without considering processes of adaptation and human agency?
- What is the contribution of the participatory planning approach to institutional and organizational change and emergence (for example, learning and adaptive capacity)?
- How does the way options are implemented impact the coherency of the strategy and subsequent outcomes? Are there emerging non-linear processes in the social and environmental system due to the plan and the way options are mobilized?
- What are the overall impacts of the strategy/plan on complex socio-ecological system and its resilience?

5.1.2 **Scientific challenges**

As mentioned earlier, traditional models of evaluation are grounded in the rationalist perspective. These models have supported the development of specific approaches such as Environmental Impact Assessment (EIA) which focus on the ex-ante assessment of the impacts of localized projects (such as a dam for instance) on the environment. EIA has then evolved into Strategic Environmental Assessment (SEA) approaches, evolving

from a local single scale assessment (assessment of a given project) to the assessment of a policy, plan or program at regional or national level where combined impacts of policy options that can impact the environment are being assessed. A large body of evaluation tools such as cost benefit analysis or computer models has been developed to inform relevant indicators and perform this type of evaluation in order to help decision makers select between different options. This type of approaches has however received a lot of criticisms: Their limitation and deficiency, underlined in the literature (Rotmans 2006; Adelle and Weiland 2012) has led to incremental changes in both in approaches and tools (Morgan 2012).

The main criticisms regarding these traditional models concern the large role given to the economic and technological dimensions compared to the ecological and social ones, the underlying hypothesis and paradigms used in the economic assessment (such as rational choice actors, efficient resources allocation or remediation of market failures), a certain insensitivity to the socio-economic and policy institutional context within which the performance of the project/plan is being assessed, a poor treatment of uncertainties, a short term perspective of most assessment methods and the non-linearity of ecosystem changes which invalidates linear approach of assessment.

Subsequent changes to methods and approaches partially catered for those limitations. They include the development of Integrated Environmental Assessment grounded in the "sustainability framework", an emphasizes on ecosystems services and livelihoods, more participative methods, specific instruments to better account for the institutional context (for example by including in multi-criteria analysis the institutional dimension, or including institutions in some models) (Olsson *et al.* 2009), use of uncertainty and risk analysis methods, introduction of visioning approach (Rotmans 2006) or the concept of cumulative environmental assessment.

Yet, in spite of the amelioration in the conceptual basis, approaches and tools, the effective place and role in decision making of SEA, IEA and other integrated assessment have kept disappointing as tools and methods have been poorly used if ever for decision making (Rotmans 2006; Adelle and Weiland 2012).

More fundamental criticisms were related to the reductionist vision used to analyse socio-environmental interactions and the narrow scope of assessment due a narrow understanding of the problem and availability of policy options. The inherent diversity of socio-ecosystem both in term of actors and sectors, the variability of stressors and the ambiguity of cause-effect relationships in natural resources management problem (Bellamy *et al.* 2001), the continuous changes and the non-linearity of change in ecosystem, the multidimensionality and multiple perspectives on impacts and worldviews, the pathways dependencies of impact (Faber and Alkemade 2011; Foxon *et al.* 2008) and multiple equilibrium perspectives calls for **a conceptualization of socio-ecosystem within the framework of complex system.**

This shift to a complex system perspective to consider environmental dynamics has different consequences for impact assessment approaches and methodology in the field of environment:

One of the main challenges resides in the integration and complementarity among assessment tools. This might be even more challenging that these tools are often used primarily by certain disciplines which may have divergent priorities and epistemological considerations. AfroMaison has been trying to address this challenge and **to line up social simulation tools and biophysical models in an effort to move towards cross-disciplinary knowledge exchange and learning.** Choice of evaluation tools must first and foremost be tailored to the intervention and the research objectives. This supposes answering questions about how practitioners intend to make use of the information collected or clarifying the focus of research for which evaluation is being carried out.

Monitoring and evaluation requires resources in terms of time, budget and people. It must therefore adapt to field constraints, regarding technology and literacy levels for instance, and availability of means. This shapes the selection of the tools, their implementation, but also the way results are feedbacked to stakeholders.

Multiplicity of scale can be a challenge when adopting a complex systems vision as it is not possible to strictly separate the different layers of scale when dealing with governance of INRM (Ducrot *et al.* 2009). The multiplicity of interactions between actors, resources and situations can result in specific pattern of socio-ecological functioning or emerging processes that can only be apprehended at a higher level such as meso-scale level. But the meso-scale level may have also its own functions and mode of interactions. A meaningful assessment consequently requires that the functions assigned to meso-scale institution(s) considered and their relationships with other institutions and organization are clarified. The assessment of the strategy may then evaluate to what extent the outcomes of the strategy actually reinforce or weaken these functions and interactions modes.

Finally, most existing procedural frameworks are specific to one or few cases and over relatively short time frames. When such frameworks exist, they are often ad-hoc and difficult to implement. There is a need for concrete frameworks and tools that can be used over the long term and across a range of cases (Midgley *et al.* 2013) but adapted to the specificity of each case. We hope that our endeavor will pave the way in that direction.

All these aspects advocate for renewed methodologies and approaches for strategic impact assessment. The AfroMaison project proposes to couple an ex-ante strategy assessment using social simulation (role playing games) with an on-going assessment of the planning processes. These assessments are complemented by more “traditional” assessment methods.

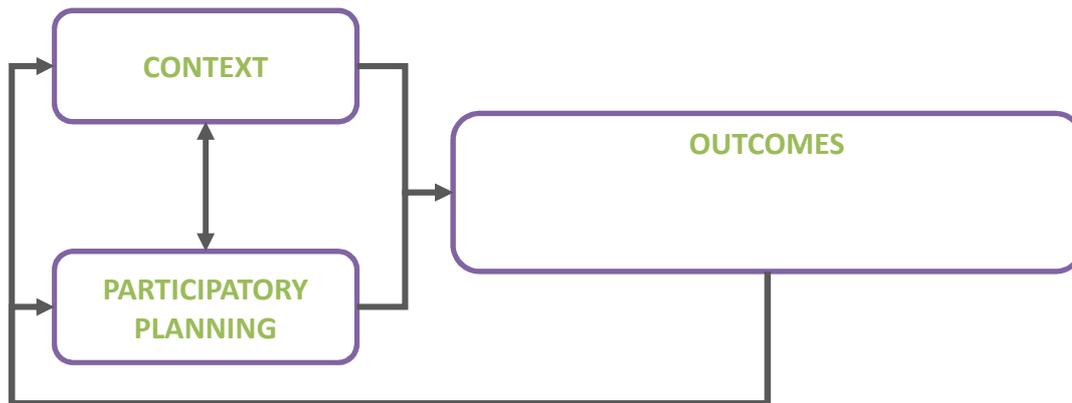
5.2 Combining different approaches

5.2.1 Procedural assessment of the impacts of the participatory planning process

The objective of the procedural assessment is to gain a better understanding of the participatory planning process, its context and potential impacts and outcomes. As highlighted earlier in this chapter, the complexity of socio-ecosystems makes the establishment of causal links and feedbacks difficult, if not impossible. Thus it is important to add to the ex-ante assessment of outcomes an on-going assessment of the process itself which is viewed as way to inform debate, critical reflection leading collective learning or adaptive management processes.

Various procedural assessment frameworks and tools have been developed in the literature, in the field of participation (Chess and Purcell 1999; Frewer and Rowe 2000; Midgley *et al.* 2013; Rowe and Frewer 2004), participatory planning or SES (Ostrom 2005; Ostrom 2009; Saleth 2006). However, these frameworks are often specific to one or few cases. There is a lack of frameworks that can be used over the long term and across a variety of cases (Midgley *et al.*, 2013). In addition, existing frameworks are often ad-hoc and difficult to implement. Therefore, AfroMaison has developed and tested a framework and tools to assess participatory planning processes. This framework has been designed in order to be used across a range of case studies while being adapted to specificities of each case.

The framework is based on 3 main clusters (Hassenforder, Ferrand, Ducrot, Daniell, et al., 2014):



Such framework is based on existing work by authors such as Ostrom (2005), Midgley et al. (2013) and (Beierle and Cayford 2002). AfroMaison does not aim at providing a list of variables that are to be assessed within each of these 3 clusters but rather at **providing guidelines on how to identify these variables depending on the objectives of both the intervention and the research**. In the case of AfroMaison, the research objective was focused **on institutional and organizational change and emergence**. Organizations are considered here as grouping of stakeholders (based on North 1990) whereas institutions are the normative and cognitive framework surrounding them. Evaluation of institutional and organizational change (outcomes) relied on the initial AfroMaison monitoring and evaluation protocol using the ENCORE paradigm (Ducrot *et al.* 2013) and its 6 dimensions: 'External, Normative, Cognitive, Operational, Relational, Equity' (Daniell 2012; Ferrand and Daniell 2006b; Ferrand 2004).

Therefore, various variables were selected in each case study within the 3 clusters and varying according to the specificity of each case context and intervention. These variables and their dynamics were monitored and evaluated throughout the participatory planning process thanks to various monitoring and evaluation tools.

The added value of such a framework and tools relies on the fact that it is:

- both **universal** (in the sense that it can be used across a range of cases) and **specific** (because it is adapted to the specificity of each case) (Midgley et al., 2013)
- both **top-down** (deductive) (selection of the variables is partly based on existing literature) and **bottom-up** (inductive) (selection of the variables is partly based on participants' goals and experiences) (Chess and Purcell 1999; Midgley *et al.* 2013)
- can be used in **Engaged and applied research**
- **Transferable** to local stakeholders who are empowered to shape and control the evaluation activities in their preferred ways (as per (Renger *et al.* 2011)
- Uses **mixed-methods who are** complementary through triangulation. Such 'methodological pluralism' is advocated, among others, by (Cabrera *et al.* 2008)
- **Emergent, open to surprises, the unexpected and the unknowable** (as advocated by (Allsop and Taket 2003; De Vreede and Dickson 2000; Eden 1995; Gopal and Prasad 2000; Hatchuel 2005; Jenkins and Bennett 1999; Kelly and Vlaenderen 1995; Levin-Rozalis 2004; McKay 1998)
- **Adaptive** in the sense that tools can be modified "on the way" to cater for misunderstandings, gaps in the initial framework, bias linked to translation and formulation.

Table 8: Comparison of the tools and conditions of implementation of the procedural monitoring and evaluation framework⁷ in the 5 AfroMaison case studies

	Rwenzori	Fogera	IND	uThukela	Oum Zessar
State of implementation of the M&E framework	<p>Extensive M&E at meso + local level</p> <p>Based on the original AfroMaison M&E framework (ENCORE) but modified to incorporate specificities linked to institutional and organisational changes (Thesis E.Hassenforder)</p>	<p>Extensive M&E developed by ILRI/IWMI/IRSTEA team</p> <p>Same than Uganda</p> <p>But:</p> <ul style="list-style-type: none"> • only meso-scale • Logbook filled in retroactively • individual longitudinal follow-up through Video interviews 	<p>Last minute minimal M&E protocol due to political constraints on the process:</p> <ul style="list-style-type: none"> • Expectations • Facilitators' notes • Questionnaires • Report after workshops 	<p>Original AfroMaison M&E framework (ENCORE - Ducrot et al, 2013; Ferrand & Daniell, 2006)</p> <ul style="list-style-type: none"> • initial assessment, interviews (cognitive mapping), ex-ante and ex-post questionnaires • partial Logbook (game test and development) <ul style="list-style-type: none"> • reports • participant observation 	<p>Informal monitoring of project activities by the Tunisian team steering committee and Thematic Working Groups (TWG)</p> <p>Reports after meetings</p>
Conditions	<p>None of the team members had specific M&E skills</p> <p>Low M&E culture (e.g. documents not conserved, no note-taking or recording)</p> <p>Autonomisation and transfer to 5 rapporteurs + tablets</p>	<p>Team sensible to the importance of M&E + professional skills (anthropologists and social scientists)</p> <p>Implementation aligned with another project with similar M&E objectives – availability of means</p>	<p>Team sensible to the importance of M&E even though not specifically trained for it</p>	<p>No adhesion to the necessity of M&E</p> <p>Implementation of the M&E is external and relies on the involvement of WP7 team members (2 Students)</p>	<p>No implementation of the M&E protocol</p>

⁷ Hassenforder, Ferrand, Ducrot, Kabaseke, et al., 2014

Monitoring and evaluation tools used are, among others: a “logbook” based on the model developed in (Etienne, 2009), document review, attendance lists, expectations, interviews, monitoring tables, pictures and videos, participants observation by researchers, facilitators and local observers and questionnaires.

Table 8 provides a comparison of the tools and conditions of implementation of the M&E framework in the 5 Afrumaison case studies (Hassenforder *et al.* 2014).

This table underlines that they were variable level of adhesion to the need of monitoring the process and consequently allocation of resources to the task. When monitoring was undertaken it was strongly supported by the UMR G-eau team with direct support to the monitoring process (see Annex 7: Challenge and operational learning in the procedural assessment for more detailed analysis) .

5.2.2 ***Ex-ante assessment of strategies using technical tools***

The overall evaluation of Afrumaison case study strategies (comprising SLM interventions as well as proposed actions in other management domains) is framed as assessment of a complex socio-ecological system (see above), since the success or failure of INRM is a function of socio-political as well as biophysical and economic outcomes, and depends on both planned and unplanned change. To complement and contribute to the complex systems framework, more traditional technical approaches to impact assessment were also used. The technical assessments nest within and are consistent with the complex systems framework, but do not explicitly capture feedback and adaptation.

Three approaches were used to assess ex-ante the likely environmental and livelihood impacts of SLM interventions: qualitative assessment; semi-quantitative analysis of changes in ES provision; and quantitative modelling (mainly hydrological). The same approaches were used both for assessing individual interventions, and for exploring the combined impacts of the overall strategies.

Qualitative assessments

Qualitative assessments of the impacts of individual interventions / technologies were carried out as part of process of choosing SLM interventions (see above), and formed part of the detailed descriptions of the technologies. These assessments drew on previous experience, local knowledge and expert analysis to describe intended and unintended consequences of specific interventions. Examples are given in IRA/OSS 2013 and in INR/IWMI, 2013. Impacts were described in terms of both intended (ie beneficial) and potential negative (unintended) consequences, including cost-benefit analysis, where information were available.

Conceptual mapping (CMap⁸), undertaken as part of scenario analysis, was also used to explore causal links and feedbacks in the system as part of assessing potential impacts (Liersch & Reinhardt, 2013).

ES assessments

The impact of interventions on ecosystem services is used as a proxy for combined impacts on livelihoods and ecosystems. Provisioning ES encapsulate the physical contribution of natural resources to livelihoods (through agriculture, wild capture and collection, water supply, fuel and fibre etc); cultural and social ES capture other aspects of landscape values and use; and natural capital is embodied within regulating and supporting services. Changes in the regulating and supporting ES (particularly habitat and biodiversity) reflect overall system health.

⁸ <http://cmap.ihmc.us/>

To assess the impact of particular land management strategies, maps of ES provision were generated and compared for conditions with and without interventions. Many of the land management interventions identified as part of the INRM strategies act by modifying land cover (for example, conversion of agricultural land to agroforestry), land condition (for example, by reducing erosion), or both. Using the ES mapping approach described by (Vandenbroucke *et al.* 2013), changes in land cover type are captured in land use / land cover (LULC) map; and changes in land condition are reflected in the provision of specific ES from the particular land cover, captured in the matrix which describes the relationship between land cover and ES.

The potential impacts of deforestation, plantations and agroforestry as components of land management strategies in Rwenzori (Uganda) were analysed using an augmented ES mapping methodology which accounts for patterns of ES demand, as well as supply (Vrebos *et al.* 2014). Scenarios for progressive deforestation, and conversely for conversion of steeply sloping agricultural lands to agroforestry and plantations, were evaluated in terms of provision of ESs of erosion prevention and water quality regulation.

In uThukela District, a more integrated approach is being explored which aims to analyse the impacts of land management programs on ES provision, but capturing the feedbacks between land use and hydrological changes resulting from both planned interventions and external drivers is challenging. Major land use change drivers are identified, and spatially explicit land use models are developed to capture and represent the dynamics of land use change, encompassing socio-economic and biophysical variables, using the SITE model (Simulation of Terrestrial Environments⁹). The land use model is coupled with a hydrological model (SWIM) to simulate-feedbacks between LULC and hydrological change. For details see (Van der Kwast *et al.* 2013). There are some issues both with availability of suitable land use data; and with validation of land use change trajectories, particularly in the context of post-apartheid South Africa, where the drivers of change are also changing. A similar approach has been used in studies under NBDC in the Jedeb catchment in the Blue Nile (close to Fogera) – see (Yalew *et al.* 2013).

Quantitative modelling

Quantitative modelling of the impacts of SLM interventions focused mainly on hydrological modelling, since in biophysical terms, the offsite impacts of SLM interventions are primarily related to changes in hydrology – that is, the quantity and quality (including sediment levels) of water available, and the way that water moves through the landscape (run-off rate, infiltration, groundwater recharge). Hydrological models were also used to explore the vulnerability of the system to climate change by simulating the impacts of projected changes in rainfall and temperature based on a range of climate change scenarios (see Liersch & Reinhardt 2013)

- SWIM (Soil Water Integrated Model¹⁰) hydrological model was used in Upper uThukela to simulate impacts of grazing management and veld burning on water availability, erosion, water quality and vegetation yields at basin scale (Pilz 2013). SWIM was also used in Fogera to simulate the impacts of changes in land management (specifically, conversion of grassland pastures to cropping; and re-forestation of the catchment).
- SWIM and SWAT (Soil Water Assessment Tool¹¹) were used in the Blue Nile at a range of scales: to simulate the impacts of climate change and conversion of woodland to agriculture in Ribb and Gumera catchments (Befekadu 2013); and to investigate the hydrological impacts of landscape-wide interventions, including

⁹ <http://www.ufz.de/index.php?en=19080>

¹⁰ <http://www.pik-potsdam.de/research/climate-impacts-and-vulnerabilities/models/swim>

¹¹ <http://swat.tamu.edu/>

terraces and bunds, on soil and water conservation in the small (27km²) Mizewa watershed, part of the Fogera case study (Schmidt and Zemadin).

- SWIM was used to simulate the hydrology in the Upper Niger Basin with the aim to assess land (irrigation) and water (reservoirs) management impacts on discharges into the Inner Niger Delta (IND) under climate change scenarios. Based on the simulation of flooding processes in the IND, the vulnerability of following ecosystem services (floating rice production, fish catch, and bourgou pastures) was assessed.
- The InVEST¹² model (Integrated Valuation of Environmental Services and Tradeoffs) was explored in uThukela District and Fogera to assess the impact of SLM interventions on individual ES – specifically water delivery and erosion prevention. InVEST uses a simplified hydrological model (for runoff) and a version of the USLE (Universal Soil Loss Equation) (for erosion / sediment yield) to generate quantitative estimates of changes in water and sediment yield under different land management scenarios (including implementation of SLM interventions).
- WaTEM/SEDEM¹³, a spatially distributed soil erosion and sediment delivery model, was used in Rwenzori to simulate the impact of changes in land cover (conversion of forest to agricultural land) on erosion.
- In Oum Zessar, where availability of water is constraining for development, WEAP (Water Evaluation and Planning¹⁴) tool was employed to assess water availability and the feasibility and outcomes of interventions relating to water allocation under a range of climate and economic development scenarios – see Box 3.7.
- In Fogera, use of a multi-criteria optimisation model ECOSAUT¹⁵ was investigated as an input to selecting SLM technologies. The model uses farm level survey data to assess the social, economic, and environmental consequences of alternative land management strategies. The baseline model was set up for the Fogera catchment, but the model was found to be very data intensive, and no scenarios were simulated.

Scenario Analysis

Scenario analysis was used in Afromaison as input to both formulating and evaluating strategies, and as the basis for vulnerability assessments. Scenarios were built for each case study using different approaches. In the uThukela and Mali case studies past trends, e.g. population growth, irrigation demands, were extrapolated into future. For the case studies in Tunisia, Ethiopia, and Uganda comprehensive scenarios were built using a participative process based on the approach of (Ogilvy and Schwartz 2004). These scenarios were framed around specific focal issues, which aimed to capture key issues and driving forces for the individual case studies, including demographic, political and climatic trends – see Liersch & Reinhardt (2013). Comprehensive and consistent scenarios can be used to challenge proposed management strategies: *Does a certain strategy hold under various possible future conditions and situations?* Strategies are composed of single interventions. The probability/likeliness/feasibility of an intervention to be implemented might be different in the context of various scenarios. For instance, a financially expensive intervention that is supposed to improve ecological conditions is not likely to be implemented in a scenario where only low priority is given to environmental issues. Potential impacts of scenarios were analyzed using a range of qualitative and quantitative approaches, including stakeholder workshops, local and expert inputs, and analysis of water availability using hydrological and water balance modelling.

¹² <http://www.naturalcapitalproject.org>

¹³ <http://www.kuleuven.be/geography/frg/modelling/erosion/watemsedemhome/>

¹⁴ www.weap21.org

¹⁵ <http://www.cipotato.org/publications/pdf/003640.pdf/view>

Potential impacts of climate change on hydrology and water availability for each case study were assessed quantitatively, based on global projections for future climate. Rainfall and temperature projections were drawn from five global Earth System Models (ESMs) (HadGEM2-ES, IPSL, MIROC, and NorESM1). These global climate models were downscaled and bias-corrected by the ISI-MIP group of PIK, and used to visualize climate change signals from two scenarios (RCP 2.6 and RCP 8.5) by comparison of future periods with the reference period 1970-1999. For details of the climate modelling, see Liersch & Reinhardt (2014).

Daily climate simulation time series of the bias-corrected ESMs were used as input for the eco-hydrological model SWIM (Krysanova *et al.* 2005) for the case studies in Mali, uThukela and Fogera; and the water balance model WEAP in Oum Zessar (see above). Hydrological modelling was not undertaken in Rwenzori, since water availability is not constraining. Outputs from climate analyses were included as inputs to vulnerability assessments (see Liersch & Reinhardt, 2014).

5.2.3 ***Ex-ante assessment of strategies using social simulation***

RPG based Social simulation was proposed to be used in a first assessment of strategies and plan. There is yet little experience of the formal use of social simulation to proceed to ex-ante assessment. Previous works on social simulation and RPGs have focused on the feasibility and condition for validity for such tools and method to be developed and contribution to learning (Etienne 2011). We thus propose the first step of an approach to more systematic use of social simulation in ex-ante assessment.

We did not have the time to do a lot of repetition of simulation thus statistical analysis was precluded. Yet isolated simulation can be useful to point out possible problems or incompatibilities: for example **pathway dependencies, technical, institutional or economical incompatibilities** between options, **non-expected behavioral responses** with positive or negative impact on the socio-ecosystem, implementation difficulties of options and incompatibilities related to system functioning as a system and its resilience.

The evaluation is based then of the monitoring of 3 types of processes.

1. **“Trends” of relevant indicators in the RPG games and/or the emergence of unexpected or undesirable value for these indicators:** tracking of certain criteria/indicators or proxy reflecting the comportment of the “ecosystem” and livelihoods (socio-economic aspects) (for example the % red marble representing the importance of the pollution). **Erreur ! Source du renvoi introuvable.** provides a comparison of the proxy or indicators used in the RPGs in each AfroMaison case study.
2. **Analysis of discussion, conflicts, tensions, tradeoffs made during the game:** identification, recording and systematization of situations where conflicts, tensions and tradeoffs are developing during the simulation.
3. **Individual or collective responses to undesired state of the socio-ecosystem: monitoring of the (expected and unexpected) reaction of players** to given situations (undesired state of the socio-ecosystem or undesired state of the environment or socio-economic context) as these adaptation strategies can change the outcomes of the strategies

Table 9: Proxy or indicators used in the RPGs in each AfroMaison case study.

	Rwenzori (Mpan'game)	Fogera	DIN	uThukela
Indicators in the model (game) used to represent external environmental drivers	None	<u>Meso game:</u> Climate, water quantity <u>Micro game:</u> Climate	Flood level, rain occurrence	None
Indicators in the model (game) used to represent impacts (of players' choices and external drivers) on the environment	Biodiversity units, fish units	<u>Meso game:</u> siltation, carrying capacity <u>Micro game:</u> Fodder production, land degradation (2 levels, static)	bourgou quantity and quality (2 levels), fish quantity	Soil units (actual soil and nutritional value), water units, Silt pebbles in dam Water pebble in dam
Indicators in the game used for livelihoods	Money units, players in trouble (loss of a family token because of sickness, poverty, etc.)	<u>Meso game:</u> Money units, livestock fed <u>Micro game:</u> (for each player): <ul style="list-style-type: none"> • Could the livestock be fed? • Could the player pay for livelihoods? 	Livestock quantity, money	Money (food) units (rural families have to sustain themselves or gain social grants, commercial sectors needs more to run their business)
Indicators more specifically monitored	Nb of pollution token / % of pollution token	<u>Meso game:</u> Water out, siltation out, wetland siltation, climate, players having trouble <u>Micro game:</u> (for each player): <ul style="list-style-type: none"> • Which complementary practice was played? • Did the player paly new practices? Which ones? 	Climate, livestock remaining / fed, bourgou degradation, fishes caught, players in trouble	livestock herd units (overstocking, disease etc), labour units (un/employed), soil units in water system/on land plots (degradation)

The protocol of assessment has to be adapted in each study but certain common principles regarding the design of game sessions for plan assessment have been identified such as: The strategy has to be assessed at meso-scale and with meso-scale actors; the assessment should include at least two game sessions: one "business as usual session" and other(s) one(s) testing the plan(s) including debriefing; suggestion of change in the strategy can be further more tested if time allow for it. "*Annex 8: Game uses for ex-ante assessment of the strategies*" provides a detailed comparison of the game use for ex-ante assessment of the strategies in the 5 AfroMaison case studies.

As we are considering jointly the social system (policy making arena) and the environment, we acknowledge that it is difficult, if not impossible, to differentiate clearly procedural assessment from substantive assessment. In this case, procedural assessment relates to the monitoring and evaluation of the impacts of the participatory planning process while substantive assessment focuses on the assessment of the strategy itself. Yet, as participatory settings, role playing games have direct impacts on the relationships between participants, on their frame of references, on their learning and these can ultimately impact individual or institutional practices. Therefore, procedural and substantive assessments are deeply interconnected.

5.3 Toward a better integration of assessment approaches

AfroMaison has tried to develop and implement an evaluation approach of strategies in a process oriented approach using a complex system background. Literature review underlined that both process and outputs cannot be disjoint which supposed to undertake in the same time a monitoring and assessment of the process and its outputs (in our case the strategies). It lead us to couple an ex-ante strategy assessment based on social simulation (role playing games) with an on-going assessment of the planning processes, complemented by more traditional assessments of impacts through different tools and approaches. The strength of the assessment framework lies in the combination of different methods, some explicitly linked to complex systems and others more connected to traditional methods, with a clear acknowledgement of the limits of the different types of assessment. The assessments are meant not to provide definitive answers but to provide insights and enrich the technical-political debate leading to decision making.

But implementation of such approaches is highly constrained: initial scientific challenges were presented. In the light of implementation of such approaches in the 5 AfroMaison case studies, other challenges, more methodological, are been highlighted that can be a source of operational learning for future uses of the framework if they are considered in a critical and reflective analysis effort.

5.3.1 Learning concerning the procedural assessment of the impacts of the participatory planning process

"*Annex 7: Challenge and operational learning in the procedural assessment*" gives insight on the challenges and operational learning in the implementation of the procedural assessment. Some interesting aspects stem out of this table which can be used as food for thought for future research and use of such M&E Framework.

In terms of the **perception of the utility of the M&E vs. final demand for valorization**, implementation of the M&E protocol on the 5 case studies was quite disparate with extensive M&E made in Uganda, Ethiopia and to a lesser extent South Africa while almost no M&E was made in Mali and Tunisia. This gap can largely be attributed to the involvement, interest and perception of the utility of the M&E by the team. In Ethiopia, project team members were researchers working for national and international research institutes (IWMI, ILRI and IRSTEA), all were professionals trained

in M&E and social research methods (anthropologists and social scientists) and all had an interest in a thorough M&E of the process for their own research. As a result, very detailed reports were made of the workshops including results of the M&E tools, providing very good quality raw data for further analysis and research.

In South Africa and Uganda, the M&E protocol was piloted by WP7 team members. In Uganda, perception of the utility of M&E increased for some stakeholders during the process. Data collected was useful for the team to write project reports (as no other memory of the process was gathered otherwise) as well as to advertise the process and the game (for instance by being able to state the number of stakeholders involved in the process so far). Transfer of the M&E protocol to the 5 rapporteurs was successful, and a large amount of data could be collected on the local process thanks to their involvement. It should be noted that one of the initial rapporteurs had to be replaced; his position was rejected by the communities he was in charge of as he was not from the same ethnic group and community members insisted that it should be one of them who should benefit from such a position and the salary going with it. In Mali, the process was constrained by political events, workshops were often delayed and had to be organized at the last minute, and therefore only a last minute minimal M&E protocol could be implemented using some of the tools that had previously been developed in other CS.

Because M&E was often perceived as only a WP7 activity it was rarely extended to the activities not fully part of WP7 for example of more technical WP. It was thus difficult to have information concerning the effective level of participation in the process (how was perspectives effectively integrated) or of qualitative outcomes from these activities. For example there was an extensive work with economic instruments in uThukela that permitted according to the facilitator's very interesting discussion with stakeholders. Yet there is very limited information of the content and orientation of these discussions that could have been useful to enrich the strategy assessment framework as reporting focused on the quantitative outcomes (scores received for each type of tools).

Regarding, **compromising between simplicity and feasibility vs. extensiveness and complementarity**, objectives of the M&E protocol have to be defined from the onset. These objectives can be for researchers (ex: to assess the institutional impacts of the process or to assess the exemplary value of the CS for other countries), for team members or practitioners (ex: to fill in the project reports, to communicate about the process and its results) or for participants, (ex: to make their progress and results visible for higher policy makers). Of course, such objectives can overlap. The M&E protocol should be developed based on these objectives.

Ideally, the different case studies can use a similar "meta-framework", facilitating cross-cases comparison, while selecting criteria and tools that are specific to each case. Such a framework was developed as a result of AfroMaison M&E experience for use in other case studies (See Hassenforder et al, ongoing). M&E tools should be adapted to each CS constraints and requirements. For instance, in Uganda, the questionnaires used with the meso scale group could not be used with the local groups due to low literacy levels. Another simplified questionnaire was developed using symbols rather than text and not necessitating the use of pens. It was decided not to use cognitive mapping as the team was not trained in such methods and that these were time-consuming in a context where stakeholder fatigue is already prevalent. A similar observation was made in Ethiopia.

The number of criteria and tools selected should be a balance between complementarity and feasibility: on the one hand, having a multiplicity of tools allows for complementarity between direct and indirect collective and individual, open and closed, punctual and longitudinal data. On the other hand, the number of criteria and tools should take into account the available resources allocated to the M&E (human, financial, logistic, time) and be selected accordingly. Technological devices, such as tablets or phones, can be very useful in contexts where information is not generally kept and documents produced tend to be lost. However, they require skilled and dedicated staff and if possible a good knowledge of ITC as their use in low-tech contexts is often challenging.

Other interesting aspects relate to the importance of technology and communication means in M&E (tablets and SMS systems for instance), the potential need – depending on the sensitivity and skills of the team on M&E - for preliminary trainings on basic M&E and use of software and autonomisation and transfer of the M&E protocol to local stakeholders.

As highlighted in “*Annex 7: Challenge and operational learning in the procedural assessment*” and in the previous paragraph, various challenges occurred in the implementation of the M&E protocol. These were mostly linked to the language and translation, the research-action posture, the tools used (recorder) and the coding and data analysis (when reading other’s notes). When it was obvious that these incurred biases or misunderstandings in the participants’ answers, efforts were made to modify the M&E tools for better clarity and understanding. Such modifications were taken into account when analyzing the data.

5.3.2 **Learning of ex-ante assessment of strategies using technical tools**

Although a variety of quantitative tools were available for assessing strategies, three common issues emerged that limited the effectiveness of quantitative impact assessments.

The first is the **availability of data at adequate levels of detail**, both as inputs to the models and to calibrate and validate outputs. Hydrological models are data intensive, requiring detailed spatial data on land cover, soils and land management; and time-series hydrology data to calibrate the models and validate results (see for example Griensven *et al.* (2012) for a critique of the issues involved in validation of SWAT models in the Blue Nile). These data are notably lacking for most case studies.

The second issue has to do with the **way in which the models simulate land management interventions**. All the hydrological models listed above simulate land management practices using a variant of USLE (Universal Soil Loss Equation) with empirical factors for cropping management (C) and conservation practices (P). Ideally these are obtained from experimental plot data under conditions similar to those being modelled, but more commonly they are estimated based on experience and literature values. SLM interventions are simulated by changing these factors, but there is little data on which to base estimates for new practices in the context of the case studies. The impact of interventions can thus be modelled only in broad terms, which means, for example, that it is very difficult to compare interventions which address the same issues (e.g. bunds vs vegetated strips). New approaches are being trialled in the Blue Nile, coupling SWAT (designed for catchment level studies) with APEX (Agricultural Policy / Environmental Extender), a modelling tool designed to simulate a wide array of land management strategies, at farm scales (Gassman *et al.* 2010) .

Thirdly, there is the **problem of model complexity**. Hydrological models are intrinsically specialist tools, requiring a significant degree of technical expertise. This expertise was not, on the whole, available within the case study teams, but was provided by external partners from academic research institutions (PIK, UNESCO, IWMI). It is thus difficult to shift these tools into an operational space for planning and management within the case studies. In addition, the complex nature of the tools meant that considerable time is needed to develop, calibrate and validate the models and in several cases, modelling was not completed within the timeframe of the planning processes.

At last, modellers has to assume the extend of dissemination or behavioural changes in the landscape (for example 30 % of this techniques is being effectively adopted) or have to rely of drivers of changes. It is difficult to fully account the feedback loops that impact the dissemination or efficiency of some interventions especially when this feedbacks loops mobilizes social institutions which are not well integrated in such tools. This is

where the combination between RPG social modelling and more traditional tools could be useful: It could permit to provide elements to justify either choice in dissemination and behavioural changes or orientations of feedback loops. Yet, it was not possible in the AfroMaison project to truly connect the different approach which remained developed in isolation.

5.3.3 ***Learning concerning the ex-ante assessment of strategies using social simulation***

The AfM-OF wanted to mobilize RPGs not (only) as diagnostic tool but as a strategy testing one. The testing protocol was only implemented in Uganda and uThukela (for one type of action only in this case). Questionnaires made after the workshop in Uganda revealed that the stakeholders did not have the feeling that they were testing their own strategy. Translation of strategy actions into action cards and processes of calibration created a gap between the actual strategy and its use in the game. This raises questions as to the importance of the perception of such tools by the participants themselves. Nevertheless, role playing games played a major role in 4 of the 5 case study countries regarding awareness raising, learning, testing and assessing various institutional mechanisms to facilitate coordination between zones and as a basis for planning.

Because we are dealing with complex system, only statistical analysis based on repeated simulation would give significant indication of the potential impact of the plan on the social-ecological system. However, except to a certain extent in Uganda, we did not have the time to do **repetitions** of simulation. Thus RPGs could not be used as a full assessment approach but as a way to test or refine the strategy by pointing out limits and problems and deepen the discussion with participants.

The second issues concerns the choice between **computerized versus non computerized simulation**. It has been chosen to represent the environmental dynamics in non-computerized dynamics; this allows for more flexibility, adaptation and innovation during the game. In formalized computerized model, action and dynamics are being limited by the content of the simulation models and anticipated feedback as perceived and modelled. They are thus more rigid and constrained. The dynamics in non-computerized RPGs are more transparent and roles can be played by actors with limited formal education which make them particularly interesting to deal with multi-scale issues in developing countries. It is also easier to organize large scale dissemination in a low tech context with this kind of tools. On the other hand, simulation with non-computerized RPGs are time-consuming, difficult to properly analysis and their scientific significance can belittle due there low tech profile. One possibility to overcome these difficulties could be to use non computerized RPG to identify the variability of interacting practices and responses and formalize this knowledge in a computerized game that could be repeated. Experimental economists are using such an approach focusing on theoretical dynamics. The challenges here is to go beyond standardized responses to take into account the impact on the context (notably socio-political or historical but also environmental). Some work has been initiated in this direction at UMR G-eau.

5.3.4 **Concluding words**

In conclusion, development and implementation of such an evaluation framework is still ongoing research. We hope that the challenges faced in the frame of AfroMaison project will be source of operational learning for future use of such approaches. Implementing such a broad evaluation framework requires the involvement of many stakeholders from different disciplines, countries, background and cultures. Communication and integration among them and their approaches is, from our experience, the toughest challenge which could not fully be finalized in this project and would deserve greater attention in future endeavors.

6 Multi-stakeholders integrated planning for NRM: opportunities and challenges

6.1 The use of Role Playing Game Social simulation

Social simulation was an important component of the AfM-OF with the use of role-playing games (RPG) based on the WAG toolkit. WAG has been developed as a toolkit specialized towards integrated water management issues (Abrami et al, 2012). The RPGs developed in Aframaison proved that the platform was also adapted to address the broader context of integrated natural resources management where water is not the main resource at stake or even not at stake at all.

A key specific feature of the AfM-OF was the process of customization for building a specific RPG from the WAG toolkit which stages the actors and resources constraints and dynamics within each case study. This process resulted in games where participants were able to recognize their environment and their practices, which holds per se a high level of potential appropriation, the counterpart being the time and skills needed for it.

6.1.1 Transfer and dissemination of tools for complexity: the key role of game designer

As mentioned before, stakeholders can and should be involved in the development of the RPG, which can then become an important part of the participatory process by itself but this requires a person leading the process confident enough with the tool. The WP7 team asked each case study to allocate one member of the local team to the RPG development. The 5 "local modelers" were trained together in workshops where the WP7 accompanied them in developing a draft version of their RPG and planning its finalization and usage, which was put under their responsibility. This involved the enrolment of "critical friends" and stakeholders in the validation and test of the game.

This strong methodological choice was part of the WP7 members' current research about transfer and dissemination of tools and approaches for modeling and staging complexity. The weak point of this choice was the high dependence of the path of the whole process on the "casting" of one person which should be at the same time legitimate in the CS, knowledgeable of its different aspects, comfortable with participatory approaches and inclusion of different perspectives, and able to rapidly build capacity in modeling and complex thinking. In Tunisia, a female intern student was sent as the local modeler. Without a strong support from the local team, she never managed to gain enough legitimacy back in the CS and the RPG tool was no further developed and used after the training sessions. In the case of IND and Rwenzori, knowledgeable, legitimate and locally engaged senior researchers were selected but they had no previous experience in complex thinking approaches. Back in their CS they shared and discussed their prototype with many stakeholders. More direct support from the WP7 modelers was needed to finalize the games and organize test sessions. In the case of Fogera, the local modeler had good capacities in complex modeling but was not so used to participatory approaches. Stakeholders involved in the development were mainly experts until ILRI researchers more focused on stakeholders inclusion got associated to the project. In the case of South Africa, the local modeler was an intern student who showed excellent modeling skills, as well as will and motivation for stakeholders' inclusion and managed to lead the process autonomously.

6.1.2 An emblematic tool for integration, staging complexity and stakeholder mobilization

As stated in 3.4 the intended primary aim of this part of the OF was to use a tool partially co-constructed with stakeholders to test their strategies. Except for the Rwenzori CS where the time and human resources involvement has been massive, and somehow for the South Africa CS where the involvement of the local modeler was strong and on a full time basis, the time and resources has been missing in the other CS to properly involve a large basis of stakeholders in the validation and test of the game, and formally test the strategies with a finalized simulation tool. However the game was generally successful in staging and supporting the sharing of complexity within the CS and enhancing stakeholders' engagement and inclusion. For this it was generally acknowledged by the local teams and the stakeholders as a successful and emblematic tool of the project.

The use of a spatialized non-linear modeling tool allows building dynamic representations of systems which are simplified but still include a large part of complexity, allowing notably integrating the dynamics of several types of resources and the practices of several kinds of users at different levels (see 3.3 for more on this). In all CS, monitoring and evaluation consistently testify of the satisfaction of stakeholders and local team towards the realistic inclusion of what they consider as major resources and dynamics within a single tool. Then the participatory simulation – it is the participants who decide how much resources will be abstracted or transformed in different part of the system – is able to demonstrate integrative transformation across scales of actions towards resources dynamics and state and conversely. In Rwenzori and Fogera, stakeholders acting at local scales (farmers) could participate in the game representing the system at the meso-scale, which allows them to understand how their practices impact and are linked across the landscape. Conversely in Fogera, when meso-scale stakeholders (managers) watched how the farmers acted in a game at the community level, they were able to get a better understanding of the mechanics of the issues the changes they propose induce at local scale and acknowledge their complexity. Eventually, the flexibility of this non-computerized tool allows discussing and staging complex relationships and modes of organization. In DIN, the participants could display a range of the complex tracery of endless talks and negotiation which rules the management of natural resource in the delta. In uThukela, the game was used to test different institutional modes of coordination between actors.

The games were also acknowledged for their impact on inclusion and engagement of a wide range of stakeholders. Rwenzori is very emblematic for this, as the local team engaged in a large scale dissemination of the tool which was multiplied and brought to communities by a team of specially trained facilitators. This allowed to involve actively over 1000 people in the OF process. Communities could understand the meso-scale issues and give their voice on it, as well as on the options proposed by the meso stakeholders. In Fogera, the game was used among other participatory tools. Anyway it was clearly perceived as a tool giving a room to everyone to participate in the process: actions in the game result from farmers practices so they are the experts within this tool. As stated for uThukela : « *The value of the information gained from interactive engagement that required stakeholders to draw, write etc (even more so in break-away groups) activities compared with general plenary discussion was evident. WAG was a good example of this*” [Annexe 10: WP7 synthesis by case study team - uThukela].

Table 10 : Analyses of RPG uses in the four cases studies

	uThukela	IND	Fogera	Rwenzori
Associated tools (in same workshop)	Planned association: Participatory mapping – as a complementary brainstorming / diagnostic tool during local level WS	Opportunistic association; DST / DeMax –as a complementary brainstorming / diagnostic tool during Ouagadougou WSs	Planned association Facilitation techniques (world café..), case studies, PV, happy strategies –as complementary brainstorming / diagnostic tools during WSs	Tablets and crossing between sites
Actors outside AFM researchers involved in the development and test of the game	UKZN students + “synergy forum” = informal platform gathering agencies/NGOs working in the area – extended testing	~20 various local stakeholders through individual interviews / consultation – no test	10 experts and researchers from ILRI / IWMI – informal testing within the workshops facilitation team	MMU students + critical (4-5 people from NGO / univ / economic development) – extended testing
Ways of using the game	Options selection: rounds played before brainstorming on options – 6 sessions with different actors categories Strategy testing : test and discussion of various institutional settings – 1 session with a small sample of actors	Strategy testing : 1 session BAU* + 1 session with activity cards including options – (10 meso-scale stakeholders involved)	Options selection and planning : as an initial activity during WS1 – 2 parallel sessions with farmers vs other SH Strategy implementation : micro-game focused on heterogeneity of individuals constraints – 3 parallel sessions farmers playing and other SH observing by landscape groups	Options selection: 1st and 2nd game session BAU* + debriefing 3 rd game session “suggesting actions” + use actions from meso-scale strategies + additional sessions refine actions and build strategy – 30 local communities + 1-2 regional WSs Strategy testing: 3 game sessions at meso-scale– BAU + test of options
success	Inclusion and engagement of stakeholders	Representation of complexity	Sharing of complexity Inclusion and demonstration Adaptation of the game to the different workshops	Sharing of complexity Inclusion of many actors – dissemination to local communities Success story used to promote the tool in East Africa
challenges	?	Perceived as too complex to be used by communities – never tried though	Transfer of the game (fast development – facilitators were assisted by WP7 members) “cumbersomeness” of the game (no inclusion of SH in the development)	Too much focus on the game – real test of strategies?

This points out how the RPG tool takes particular value when it is wisely (or opportunistically) associated with other tools to diversify ways of thinking and confronting with each other views, and also for contributing in keeping participants active. In this case, great care should be given to the quality of the facilitation and the information generated should be carefully monitored. Care and time should also be given to periodization and processing of this information, after mind opening through complex thinking. In Uganda where the Mpan'Game was multiplied and became emblematic, participants and managers were tempted be happy with just playing the game and the local team has to be very careful towards easy hijacking. The game is a sexy and popular tool but it should not become the center of the process.

6.1.3 **Articulation WAG and ES: a missed opportunity**

The complexity was also tackled through the ecosystem service framework that played a key role in the diagnostic and assessment of the situation as well as in the ex-ante assessment of the strategy. Expert knowledge in particular mobilized this theoretical framework to spatialize issues, prioritize areas of interventions and assess strategies.

From a methodological point of view, ES approach and simulation game development and use can be interconnected at different phases of the Afromaison operational framework (Figure 13):

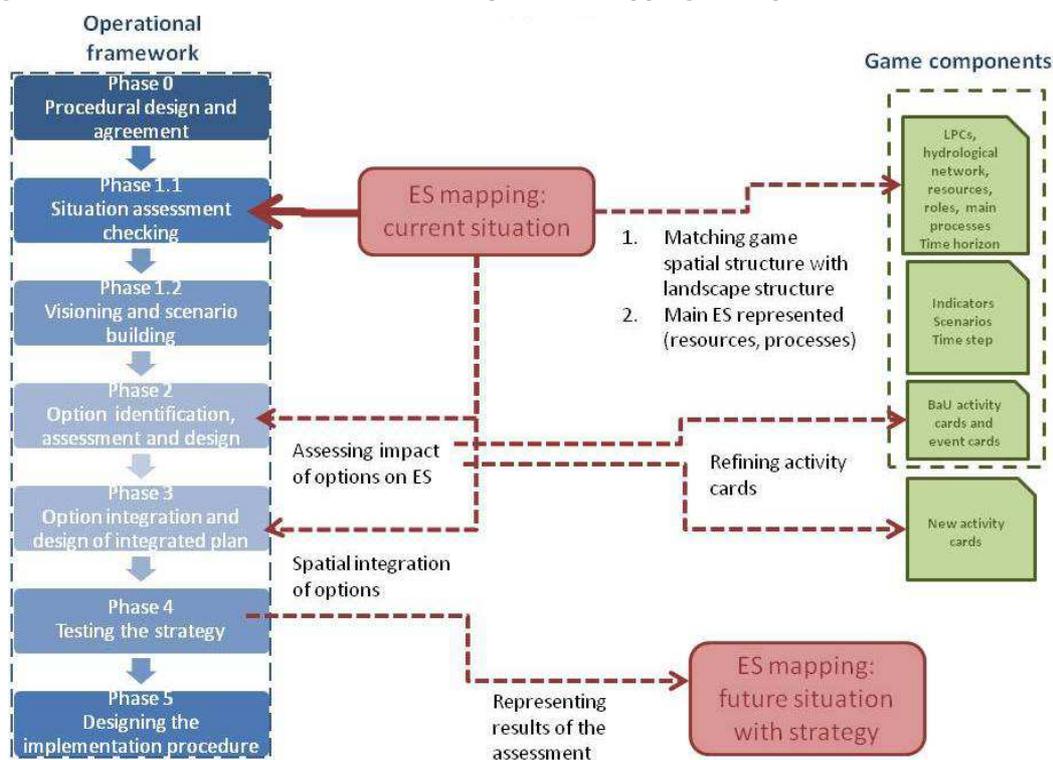
- Current situation map of ecosystem services supply and demand provided information for the situation assessment (see section 4.1.).
- The same information can also be used to match the spatial structure of the game board with the landscape structure and to represent in the game dynamics and features the main identified ecological processes and challenges.
- As presented by Lewis *et al.* 2014 and summarized in section 4.1.2, ESS mapping can also be used to assess the impact of individual options on ecosystems and ESS provision and for the spatial integration of options. This provides information for refining the activity cards used in the game by specifying where on the game board the activities can be played and what their environmental impacts are.
- Finally, results of the integrated strategy assessment, partly based on social simulations with the RPGs, can be represented in a map of the ESS future situation.

Although the project claimed to adopt an ecosystem approach and ESS mapping exercises were undertaken in all CS, the development of the simulation games was hardly explicitly framed around ESS. Reasons for that include:

- In many cases, ESS mapping started after the initial development of the game, and was conceived as a separate, expert-based activity, not really integrated into the game development process.
- Simulation game is based on a complex system approach in which the more analytical ESS approach does not fit well.
- The games were developed on the basis of local stakeholder perceptions of how the socio-ecological system functions and the categories used by local

actors to describe their system are not necessarily organized along the lines of the ESS typology, even if they often clearly acknowledged the linkages between the ecosystem and the socio-economic system.

Figure 13 : Articulation between ESS analysis and mapping and operational framework



In Oum Zessar, assessment of ecosystem services and development of the INRM strategy were done in rather separated processes. Although the results of the ESS mapping exercise were presented to stakeholders involved in the formulation of the strategy, it is not clear whether this information was considered or not while building strategy.

In uThukela, a qualitative ESS assessment was undertaken, looking both at provision of the services by the different land cover classes, and at the demand for ESS on the basis of population density and relative spatial location of ESS supply and beneficiaries. A more in-depth quantitative analysis using satellite images and taking into account the vegetation condition was conducted, as well as a more detailed analysis of demand for the 6 most important services (reported in Quayle and Pringle 2013). Outcomes were used to identify where to focus management interventions included in the strategy. The development of the role-playing game also included participatory mapping of perceived environmental issues, which results were incorporated in the game board spatial structure and represented environmental and social dynamics. However the two processes and their results were not integrated in one another.

Nevertheless the notion of ES is implicitly present in most of the games as shown in Figure 14. ES are represented in the games in two different ways:

- as a resource (for provisioning services), using tokens
- or by activities played by participants (for provisioning services such as food production or fodder production).

Figure 14. Representation of ecosystem services in the case study role-playing games

Type of ES	ES	Uganda	Ethiopia (Meso / Micro)		South Africa	Mali	Tunisia
Provisioning services	food	smallholder & commercial agriculture	subsistence (mixed crop system) & cash crops (vegetables, pulses, rice,		subsistence & commercial crops	Rice (3 types), vegetables	olive, vegetables, cereals
	fodder	livestock grazing	livestock grazing	fodder	livestock grazing	bourgou	livestock grazing
	wild capture / collection	fishing, hunting	fishing			fishing	
	water	Pump, borehole, small reservoirs	drinking, irrigation	Water access as a static asset	drinking, irrigation	Flood extension as a scenario parameter	drinking, irrigation, industry
	raw materials	sand mining, charcoal burning, eucalyptus growing, timber cutting	eucalyptus growing, timber cutting eucalyptus growing			Eucalyptus growing	fuel wood, plants for craft
	medicinal resources	herbal medicine clinic, Family medicine plant gardens	Khat (?)				aromatic and medicinal plants
Regulating services	regulation of water flows		Flood regulation by wetlands				soil & water conservation
	waste treatment	organic pollution "treated" by wetland and forest + sanitation, Non-polluting Washing bay (activities)				waste water treatment	
	erosion prevention	restoration of river banks, Construct terraces	rehabilitation techniques, livestock management & silted water		rehabilitation techniques, livestock management & silted water		soil & water conservation
	maintenance of soil fertility / land degradation	conservation farming	rehabilitation techniques, livestock management		rehabilitation techniques, livestock management		soil & water conservation
	biological control					water borne diseases	
Habitat services	maintenance of life cycles of migratory species					migratory birds	
	maintenance of genetic diversity	Bee keeping, Tree planting, Fishing with authorized nets		Bee keeping	X		
Cultural services	opportunities for recreation and tourism	Promotion of tourism in Rwenzori region, Hotel, Camping site, Tour guiding			X		X
	energy generation	hydroelectricity, bio-gas, energy saving stoves	dung collection		hydroelectricity		

represented as a resource (tokens)
 represented by activities
 existing but no represented in the game

Thus in each game at least two services were represented by token that was the core of the dynamics studied. Other services were considered as possible activities. A better connection between both frameworks would have meant to make sure that the "token-based" services were indeed the most important services as identified by stakeholders on one hand and that all services of relevance were considered in the game. Analysis of game session could have provided insight of interrelations between services.

This missed opportunity underlined the difficulties in effectively integrating frameworks that are loosely mastered at the level where integration is supposed to take place (the case study level in this project). But in a way it is emblematic of the difficulties of integrated planning met by practitioners.

6.2 *The operational framework as innovation*

At case study level and for many of the researchers involved in the AfM project the complex system approach that sustained the operational framework was a new approach. Innovation studies have underlined how crucial is the building and consolidation of a network of actors around the innovation. Contrary to the linear vision of innovation which often prevails in development, these studies underline that complex innovations succeed if they can engage a network mobilizing in the same time the actors in charge of the development of the innovative "product" (a technic, a process etc) with those involved in its dissemination and implementation (Fichter 2009; Latour 1987).

In Afrimaison, the engagement of researchers was looked for through the development of training and workshop at project and case study levels. But, the individual appropriation and engagement of researchers was unequal depending of (scientific) background and previous experiences of participatory approaches or interactions with actors. At case study level, the "appropriation" was closely related to the interest of one/two key team actor/leader to the emblematic tool of role playing games. If RPG inherent participatory and integrative quality was acknowledged, other characteristic was not necessarily well shared such as (1) its powerful explanatory, interpretative and communicative value concerning system functioning – as any model – (2) its mobilizing capacity due to its easy appropriation by a large variety of actors and game feature (3) its ability to represent a complex system functioning in an accessible way.

This is why the selection of the RPG designer/WP7 champion at CS level was particularly crucial. In practice this CST member was in charge of the development of the tool and/or approach as well as the organization of the related workshops. As already underlined, it requires interest toward complexity and modelling, good knowledge of the situation and good level of (political/institutional) connections. Although modelling skills is necessary to develop the RPG, the modelling tasks can be subcontracted to someone else working closely with this champion.

In Uganda, IND and Ethiopia a senior scientist with good local connections took charge of the RPG development and coordination of operational framework. Yet the modelling was permitted by an important effort of companionship through intensive investment of interns and phd students at MMU. This companionship was rendered difficult in Mali due to the political situation which limited travelling to Mali while the main researcher engaged in the development of the tool felt ill at ease with the tool. In Ethiopia, an hybrid path could be found as nobody was able to take charge of the game development after the departure of senior researcher in charge of the modelling. But the interest and trust in the tool of an NBDC ILRI anthropologist and her efforts to gather important human and time resources for it allowed to bring WP7 researchers to Ethiopia together with a local team 2 times a full week before the workshop. It was just enough time to finalize a prototype and train / capacitate / entrust facilitators with it. The uThukela CS was the only one where the methodology was developed entirely by the local team (with distance support from WP7 team): a Ms level trainee at

ease with approaches of complexity and modelling was mobilized on a full time basis and developed the core of the simulation workshops with support of the team leaders. Yet a better integration of the three innovative processes developed in this CS (ES mapping, economic tools and complexity modelling and simulation) would probably have necessitated the mobilization of a local senior researcher familiar with complexity approach and participatory simulation to make the most of the convergence of processes and outcomes.

If the use of participatory modelling and simulation to tackle complex system related to natural resources management has been raising an increasing interest in the last ten years (Suarez and Bachofen 2013) but there is still few experiences and successes in multi-level approaches mobilizing in the same processes - but in different arenas – actors with different policy level mandate. The insights of AfM concerning the settings of multi-level stakeholders engagement for these objectives are consequently important and are currently the subject of E Hassenforder' phd thesis (to be finalized end of 2015).

The Rwenzori CS is also one of the few experiences of large scale **autonomous dissemination of participatory simulation tools**: the process permitted to engage some 35 communities in which the Mpangame game was used between 1 and 8 times. Among them, 21 communities were particularly active and 3 communities retreated from the process. In total, some 131 simulations were undertaken at community level mobilizing on average 12 participants per session (50% are women, 33% are men and 17 % children). This permitted to mobilize more than 1500 « one-shot » participants and 800 regular participants. An ample monitoring and evaluation protocol using mixed methods (logbook, attendance lists, expectations, pictures & videos, participatory observation, questionnaires and interviews) was developed, implemented and transferred to local stakeholders in order to assess the process and its outputs, outcomes and impacts at both meso and local levels. At the local level, results showed that the process mirrored existing power relations while generating phases of discussions, brain storming and critical thinking among participants. Substantive and social learning happened throughout the process and conflicts and arguments emerge about competing visions of the landscape, activities to be undertaken and impacts of one's activities on others. In terms of outputs, behavioral change and new practices could be observed, both at individual (ex: picking polythene bags from rubbish pits) and collective level (creating a pit for abattoir and moving the washing bay in Kaserengethe, conservation of the partly reclaimed swamp towards Bulyanyenje). Even though direct link with the process cannot be claimed, it was certainly one of the drivers. The contribution of this kind of extensive participatory process in institution building and collective action is currently being assessed in two Phd¹⁶.

¹⁶ E Hassenforder : Multi-level participatory planning for aiding the development of meso-scale institutions for natural resource management. AgroParisTech, Paris, France and University of Australia, Canberra

M Pommerieux : Evaluer les effets de processus d'apprentissage sur l'action collective dans le cadre d'expériences participatives: la perspective de la science politique sur les apprentissages de long terme, Université Montpellier 1, Ecole doctorale droit et science politique

6.3 Participation and stakeholders engagement in meso-scale integrative planning

For all CS team, one of the most interesting features of the operational framework lied in its focus toward stakeholder engagement and participation.

Different types of learning were highlighted depending to the main orientation of the process: In Tunisia and IND, the team emphasized the value of the platform gathering experts of different levels and specialities and a variability of actors with local level engagement. The platform was particularly instrumental for knowledge sharing notably about needs and demand from actors.

Participatory, communicative and collaborative planning approaches are often criticized to tend to focus on the process while overplaying the wider context in which the participatory process takes place (Healey 2003; Fainstein 2000). One, among other possible solutions, to overcome this limitation is to make an in-depth analysis of the institutional context surrounding the participatory process (Blackburn & Holland, 1998; Williams, 2004). AfroMaison, through its preliminary baseline study (WP2) was able to gain an in-depth understanding of the contexts of each case study sites in which the planning processes took place. It included a stakeholder analysis of the NRM stakeholders in the case study sites. Previous involvement of the project teams in the area of focus was also an invaluable asset.

Yet as previous studies have underlined it, participating in multi-stakeholders platform do not equal having a voice in a process: like any political arena, multi stakeholder platform are a place where power relationships are being expressed. They can take different form such as using power to influence the inclusion or exclusion of some SH groups in the discussion or highlight some stakes while ignore others, etc. RPG simulation sessions are not void of this power play even if its playful feature may help to address this issue: By embodying a "role", participants can voice out power inequalities and dynamics which they may not have evoked otherwise, either because they did not dare to discuss them, or because they were not even conscious of them (Gaventa's "hidden power", 2006). For instance, in one of the communities in Uganda, the game led to a reflection during which a woman said "Our husbands should stop forcing us having sex with them", immediately backstopped by other women in the group. Participatory processes can create spaces for alternative discourses and knowledge to emerge (Escobar, 1984) if tools such as role-playing-games strengthen the means of passive resistance which the most marginalised participants have at hand to resist the "tyranny of participation" (Cooke & Kothari, 2001; Scott, 1985). As underlined the literature review (part 1.3.1.3), it also supposes to clarify the choice of participants, that is to address the following question: How were stakeholders groups defined? Who defined them? How was the meetings convened? What is the legitimacy of a given participant to represent the SH given what is expected from his participation (knowledge sharing or decision making forum)? Have the participant sufficient technical capacity to participate meaningfully etc. These are traditional questions when organizing participatory meeting and that should be accounted for in monitoring and assessment work. Unfortunately in many of the workshops, the level of monitoring and assessment did not allow for identifying potential problem in this regards.

At last addressing power issues supposed to clarify objectives and agendas of the the participants, as well as into compromising with participants' own expectations and objectives. Participants were asked to state their expectations at the beginning of each workshop and to evaluate at the end to which extent these had been met.

The IND team appreciated to have been able to mobilize a core group of meso-scale actors which participated to the different workshops of the project in spite of the difficulties. This included the organization of two key workshops outside of Mali. While participants were a captive target, this constrained the workshop format with imposing intense interactions in a few days limited to a small group of actors. A format of a sequence of 2-3 days workshops spaced out in time would likely have facilitated capitalization. Indeed the format must be adapted to local situation: the uThukela CST team insisted on the difficulties in long term mobilization of actors and stakeholders' fatigue: people were often reluctant to make themselves available for more than a day or two.

These differences also underlined the need to prepare stakeholders engagement: Specialists of participatory process do not hesitate to spend an important time to undertake initial consultation and dialogue to secure the commitment of high level essential organization in the process. This preparatory time can take as long as a full year of time. But in a project-based process which has a limited time frame these essential steps are often forgotten or undervalued. In this sense the opportunity to benefit from the already established Innovation Platform in the Fogera/Blue Nile CS was a chance.

Experience also shows that securing the engagement of a small core group of actors (the champions) that can help defining the content of the process and the implementation of the main steps is often also very useful. In this respect the disconnection between the first diagnostic phase initiated very rapidly and the other steps of the OF could have been better managed. Sharing and validating the diagnostic could have been an opportunity to effectively mobilize and engage these champions by developing adequate mechanisms allow for their active involvement.

As the uThukela team underlined it, participation was especially valuable when the team managed to mobilize actors around specific activities for example in small group as opposed to the traditional presentation mode. Boundaries spanning tools (such as RPGs, participatory maps or economic tools DSS/DeMax) proved particularly valuable for concretely engaging actors into manipulating the information and knowledge to make sense of this information. But one may think of different exercise such as narrative or comparison between maps etc

But in many cases, they have been little discussion how the diagnostic outcomes could be more effectively be presented and discussed, and formal presentations took over which may have limited the effective sharing of valuable information. Other way of proceeding demand workshop preparatory times which have proved valuable as exemplified in Fogera Such a preliminary preparatory work could also have been interesting to better inform and capacitate actors on some aspects and concepts related to INRM. The need for preliminary capacity building and preparation on the concepts used in INRM has been underlined in different CS.

Game playing was perceived in South Africa, Ethiopia and Uganda has a particularly powerful approach to mobilize, share and discuss complex issues and broaden its understanding. This is not the only tools with such a capacity: the participatory mapping exercise (uThukela), participatory video (Fogera/Blue Nile)

or individual case study narratives (Fogera/Blue Nile) were also very effective to support the sharing of information. The information provided at this stage could have completed the initial diagnostic but the linear conception of activities did not allow for fully use the information provided.

Interestingly team members that participated to the first real test of the IND game did not share this enthusiasm: although they appreciated the ability of the tool to raise issues and discussions, team members were sceptical on its value for local based actors due to its complexity. This is could be explain by two reasons (1) the political situation did not allow for a proper test and finalization of the game (2) the facilitation has to be shared with the (external) game developer as the local facilitator was not feeling comfortable with the (unfinished) tool.

After 10 years of experiences with game making, it appears that a game needs at least various real tests with non-specialized actors (students) and one or two test with real actors (generally champions) to be fully operational (e.g. simple enough to be played and enjoyable). On the other hand the iterative tests are also a way to refine the understanding of the functioning of the system by validating hypothesis that sustains the modelling. This last step was not possible in the case of Mali and the game is still to be finalized. In Ethiopia, it was only when the game was tested for the first time with the whole local team (after 2 weeks of development mobilizing one only designer) that a major error in the representation of the system could be detected. From this point, the game was finalised in a few days' time with the whole week. This produced a prototype which was playable and appreciated by the participants but a bit "cumbersome" according to one member of the team because lacking more immersion and testing with the local stakeholders. Yet this comment underlines the importance of engaging local actors in the building and validation of the game on one hand but also the need to allocate a sufficient length of time for the development (at least three full month of work).

One type of settings was highlighted as particularly interesting in term of participation: gathering and engaging actors from different "levels" in the same workshops but in separate groups to do the same exercise as in Ethiopia. They could then directly perceive the different understanding, value and preferences of others groups by confronting the outcomes of the exercise. As presenters used their own words, interpretation of meaning was not externally mediated and appeared more truthful. Moreover, engaging actors with low level of formal education into the same exercise than other actors and letting them expose their outcomes was also an interesting empowerment strategy. Conversely when actors from higher level were brought to express their constraints just as farmers just did, it was very effective in stepping out from focalizing efforts on repairing supposed problems of poor farmers to starting to think in a more holistic approach to an interdependency of disfunctionalities and responsibilities across levels.

As a conclusion there is a consensus among the case studies to acknowledge the value of the use of innovative participatory tools to motivate an active engagement of the stakeholders during the workshops. On a substantive perspective, the participatory activities have generated an important amount of rich and complex information, as the different stakeholders were able to describe their practices and constraints but also provide sound analyses on on-going or planned interventions. On a procedural side, the opportunity and motivation given to different types of stakeholders to voice their view was certainly effective in contributing to the acknowledgement and legitimization of each other's

perspective, which is a prerequisite to establish conditions of a proper collaborative work. It is also worth mentioning how as it can have been observed in many cases in the literature (Etienne 2011) at least in the Rwenzori CS and maybe in the Fogera CS, the RPG, with its "fun" and accessible appeal, and the immersive collective experience it creates, has become an emblematic tool, both for the stakeholders (participants in Fogera still mention their appreciation of the exercise to the local team coming for other purposes several months after) and the local teams (replication of Mpan'Game and creation of the Mpan'Game club in Uganda, Ethiopian workshops referred as WAG workshop though WAG was used only a few hours during 2 or 3 days workshops). As such the tool and the experiences with it are often cited during later discussions or M&E interviews about the project.

Yet if the outputs in terms of social capital, learning or social relationships are undoubtful, it can be questioned whether this is enough. The substantive outputs of workshops is a rich mass of information, but it needs time and resources to be processed and capitalized but also challenged against other outputs, notably those from expert or scientific knowledge. This was an issue during the project as time was lacking and responsibilities on who should take this work in charge were not always clearly defined.

Another question lies on the ways to carry social and institutional extension of the process. This can only be achieved if local staff members have been able to build enough capacity and appropriate themselves the process enough to reproduce it and train other staff. This transfer of complex approaches with simple tools is a research challenge as it is not just about transferring a tool, but a whole different way of thinking. Another path is to spend enough time during the process to create a finalized game which can be replicated and easily learnt as in Uganda.

All these remarks advocate for careful time and human resources allocation before, during and after the participatory workshops. Working with experimental tools needs time for preparation / appropriation / capacity building for the facilitation team. The involvement of the whole team over a week time to build the workshop agenda, plus the internal debriefing sessions during the workshops has proven very useful in Ethiopia as it has allowed creating a good team spirit and getting the best of everybody's skills and knowledge. Time will also be needed for reporting, analysis and capitalization of the workshops outputs. Eventually it is important to preserve resources and time for supporting mobilization of core stakeholders to another process. Concerning the specific RPG tool, time is needed to build capacity of at least one local staff with the tool and support him/her through face to face and distant companionship in the involvement of local actors in the test and development of the tool. For the RPG reaching a state where it can be replicated and distributed with minimal training, several weeks of full time work should be allocated for the polishing.

As a final recommendation, we advocate strongly for an open and flexible approach of participation. It has proven very useful in most of the CS to combine tools and facilitation techniques within and across workshops. This nurtures shifts of perspectives and keeps stakeholders active and interested. The architecture of a workshop should be built carefully, according to the objectives at the moment, but also to the skills and experiences of the facilitators. If a critical size of participatory approaches practitioners exists locally, community of practices where participants invite pairs to test their participatory tools when they need as it is done in the CIRAD/IRSTEA team are also very useful.

6.4 **An operational process facilitating integration?**

The Integrative capacity has also been assessed as one of the main strength of the AfM-OF. It has indeed permitted to consider jointly different environmental issues (land degradation/erosion, water quality and/or quantity, biodiversity etc), to take into account in the same time environmental, social aspects (infrastructure access in particular), and economic aspects (notably related to livelihoods) and sometimes governances issues. It facilitated multi-scales consideration notably between local (community/village) and meso-scale (*district / Cercle / woreda*) through the interaction of large variety of actors (citizens, users group representatives, NGO, government administration bodies etc).

Yet, different level of integration can actually be observed between the mere juxtaposition of elements keeping their identity even if other elements are being considered in the same time to transformative integration where a new element with its own identify replaced the previous representation of juxtaposition. In the middle lay different level of linkages and relationships between elements. This is the same kind of difference between multidisciplinary, interdisciplinary and transdisciplinary approaches.

The integrative capacity of the OF was particularly highlighted by 3 CST (Oum Zessar, uThukela, and Rwenzori) but integration was most of the case understood as the ability to consider jointly elements that were previously considered on their own and the ability to align options and management tools to issues.

The analysis of implementation of the OF and outputs underlined however an unequal level of integration between the different aspect (stakes, territories, actors, level, options) in each CS. While integrative transformation effectively occurred in some cases and for some aspects, most of the time integration was limited to juxtaposition.

For example the territorial view of INRM remains strong in **uThukela** even if the need to coordinate implementation between management zones has been acknowledged and an institutional framework discussed. Yet if the dynamics that link territories (migration, cattle, water flow, fire etc) are acknowledged they have not been worked upon on an explicit manner. Rwenzori strategy was regionally integrated even if communities depending of local specificities had adapted strategy locally. And if the links between actions has been acknowledged in the COOPLAN exercise the final strategy at meso-scale or community level remains a juxtaposition of actions. In all CS strategies are often a juxtaposition of actions more or less organized around intervention objectives (**uThukela**), domains (**Oum Zessar**), strategic orientation (**IND**), or one specific intervention objective (cattle management) (**Fogera**).

If the main stakes of GIRN (social, economic and environment) were considered in all case studies, the interactions between them have rarely been systematically explored, except partially through the ES mapping approach. This approach emphasises the trade-offs between the different types of services provided by the landscape but does not explore the drivers and links between different aspects. For example in most strategy the social and organizational aspects around (water) infrastructure maintenance are insufficiently addressed and when adressed focuses on the role of institutional aspects for infrastructure development. Similarly the relationships between poverty, social organization

and environmental risk are not address in an explicit manner in **uThukela** where these issues are particularly acute. A more systematically exploration of the links between economic, social and environmental services is needed to overcome the prevalent dual vision opposing an environmentally friendly strategy to a livelihood or development strategy.

Some methods have proved instrumental in facilitating the development of integrative transformation by opposition of mere juxtaposition notably:

- Having different groups of actors (from different level mandate) involved in the same type of exercise during a given workshop and each groups explaining the outcomes of the exercise before an consensus building exercise.
- Having economic instrument exercises carried out in the workshop that dealt with other aspects (options selection, RPG).
- Making use in workshops of tools emphasizing the links between elements considered (zones / actions / actors) such as RPG focused on the main issues or participatory mapping
- Systematic monitoring and assessment of discussions complemented by systematization, organized feedback of knowledge thus generated. Making the most supposes of the rich multi-stakeholders discussion also avoiding a concentration of intense discussions in a long workshop to space out in time shorter meeting to give time to actors and researchers to integrate and capitalize on the discussions.

But to make the most of these approach, the links that emerged during these exercises must be more systematically explored, and reused in following work..

Some issues, actors or level were under-represented in discussion or actors representations: commercial farming (Rwenzori, uThukela); non-rural activities driving water demands (Oum Zessar); some key actors group such the Dioro in IND; Women in uThukela and in Oum Zessar where they acknowledged to have a key role in NRM due to migration; migrants in Oum Zessar, regional level (Fogera), EI (Oum Zessar, Fogera, Rwenzori).

In **Fogera**, the main issue was restricted to one intervention domain (free grazing) due a strong involvement in the process of researchers that had undertaken previous research in breeding and cattle rising. Although strongly related to land degradation / soil erosion and touching other aspect (water scarcity), concentrating on one intervention domain excluded a systematic exploration of natural resources issues and dynamics. On the other hand it had permitted to develop a more focused strategy even if the final strategy was still a juxtaposition of actions.

As also underlined, they also no real integration of the main theoretical framework used: complex social-ecosystem dynamics and ecosystem services.

These difficulties points out for renewed attention to the following aspects on the OF

- 1) **Coordination between the diagnostic and the other stages of the processes.** The rapid assessment provided a rich body of information on which to build the process such as knowledge of the group of actors

important to consider, the main issues, some of the dynamics, the territorial and management boundaries to integrate. But it was on the whole not well connected with the following exercises.

- 2) **Stronger coordination between WP organized by the project institutional framework.** The project workplan was centred on thematic work-package where expert knowledge was embedded. This facilitated the emergence of centrifugal forces where each experts with their own agenda competed to access to stakeholders. Integration was supposed to occur in process planning at CS level but it supposes a strong CS leadership to compensate from this centrifugal forces.

The difficulties to successfully organize the coordination can be understood as representative of the difficulties of INRM as a whole when technical bodies with their own objectives and agenda are supposed to coordinate with one another. At the most a territorial authorities are requested to operate this integration through planning but most of the time they lack human and financial resources, skills as well as power to counterbalance the centrifugal forces of the technical program and agencies.

A CS oriented project supported by a coordinating WP aiming at design and capitalizing on integrative process at CS level may have help to enhance integration.

- 3) **Stronger engagement and involvement of expert in the process itself** with for example having a third group of actors - the (CS) thematic experts - interacting with the other stakeholder (meso-scale / local) on the same basis on one hand and/or a in organizing and validating the coherence of workshop outputs. Expertise in complex system can indeed be mobilized in different manners: (1) to propose innovative solutions that can not necessarily known (2) to help specify options in a more specific manners (resources,) ability to acknowledge when further studies are needed (3) to assess coherencies and compatibilities between option which could include specific assessment tools. In this aspect, integrative discipline (such as geography or economy for example) could have been more mobilized to analyse the outcomes of the processes. This was partially done with the spatial analysis but the economists focused on support to identifications of options and did not really engage in the overall assessment of the outcomes.
- 4) **Bettering prioritization process in the strategy building phase.** There is a need to better organize the prioritization of actions so that the strategy gathers a manageable number of well-targeted actions whose interactions can be more systematically exposed and understood. They were no real prioritization (for example in term of timing or leaving out options). In this regard, the COOPLAN phase could be preceded by a participatory exercise permitting to collectively calibrate needed resources as well as impact according to a better specification by level: in this exercise calibration should distinguish between the cost of disseminating a given items (for example a cook stove) and the acquisition cost of the cook stove itself by families. Small groups could then select action and prioritized them in time and space. Aggregation in Cooplan Matrix which is very time consuming could be an expert based process but the matrix should be further refined by actors to match resources constraints and impact leverage and reinforcing possible synergies or avoiding incoherence through analysis of linkages between actions. This latter stage, which was initially previsted has never been undertaken due to time constraints

- 5) **Building of a shared understanding of the role and place of economic instruments.** In a world dominated by an economical stance, EI are powerful incentives to change behavior. But however well adapted or fine tuned to a local situation they are complex and difficult to implement and manage, and demand specific governance and organization and occasionally political negotiation. It seems thus unrealistic to rely on a large numbers of EI in a strategy. They could be targeted to support interventions with leverage potential but possible limited support, or with anticipated difficult implementation or involving high political trade-offs. The efficient implementation of EI for natural resources has been related with this ability to support a given strategic orientation with good leverage impact.
- 6) **Exploring the role of computerized complex system oriented tools in such process** Although RPG permitted to explore some links between actors resources and domains this tools have also its limits (time for simulation which limits the number of simulation and scenario that can be explored). Development of computerized social simulation tools or other complex system based tools could have help to explore links and consequence of some scenarios or strategies. Although this had been initially forsought (for example in Ethiopia), it has not be possible to implement. As other high tec approach discussed above, this kind of approach raises two main difficulties: the time required to develop the model and the availability of data. Given this limitation some modellers advocate building imperfect and simplified computerized in order to be able to early in the process undertake simulation and use the simulation to explore jointly with system stakeholders system functioning. RPG conceptual model can be used in this kind of model allowing organizing a dialogue between the two type of model (Le Page *et al.* 2014)

6.5 An operational framework encouraging innovations?

If the OF was acknowledged to efficiently promote effective participation and integration – inclusively of connecting options of different natures - its innovative capacity was unequally appreciated. On one hand case study teams appreciated the promotion and use of new tools such as the RPG (IND, Fogera, uThukela and Rwenzori), WEAP model (Oum Zessar) or the DST/DeMax tool (IND).

Yet, the whole framework did not globally promote innovative options for INRM: For some the importance given on stakeholder's participation necessarily limits the innovative capacity of the OF as actors will necessarily select already known options. They might also give preference to actions with short term economic return. The IND case study team even complained that it promoted options that could have detrimental effects to the environment.

This perception was however not shared by all local team members. In some case some actors, notably meso-scale actors could have been engaged in other networks and thus confronted to innovative practices they promoted in the AfM-OF OF. In Rwenzori for example participants from NGOs (inclusively in community workshops) proposed actions un-practiced in the area they had been confronted to in other contexts. Consequently some new activities were proposed, even at community level. Actually, monitoring in Rwenzori area underlined that participants particularly valued being exposed to new practices and options which points out to the occurrence of some kind of dissemination of

new practices at local level which was not necessarily perceived as such by expert or meso-scale actors.

Innovative options are by definition little known by a vast majority of actors. If they are known, there is generally little available knowledge on their behaviour in the local system (level of input, adaptation to local environmental, institutional, political and social context, effective use by local actors, and concretely outcomes). Some aspects can be specified through local experimentation and fine tuning but this experimentation will be necessarily limited in scope and extend and some interactions or emergence processes may not be visible or possible to assess in localized experiments. DST/DeMax tools and SLM selection tools assumed that it could be possible to narrow down the scope of possible options according to some criteria better adapted to some context.

As underlined in part 4.1.2.3 automated pre-selection presents some limits such as scale issues or level of specification. Participatory uses of these tools may partially compensate for these limits provided the related discussions are adequately capitalized: Most actors involved in the DST/DeMax exercises had little previous knowledge on economic instruments. But as underlined in WP4 report (Lewis *et al.* 2014) the discussions generated around implementation context and constraints was very much valued as it contributed to the shared understanding of the situation as well as concretely engaging actors on in-depth discussion concerning this innovative instruments that were previously little known.

Previous studies have underlined that that the outcomes of SLM interventions is closely related to the way they are being promoted and implemented in one hand (pathway dependency to implementation), and finally maintained in the long term - see Batchelor *et al.* (2000) for example concerning the sustainability of boreholes. What matters is less the technical contents of the innovation that the governance issues for innovation dissemination and management. Thus in SLM interventions, innovation might not be so more the intervention per-se that could be well known but the way they can be implemented and managed that is how the different actors (notably at meso-scale and local level) are mobilized and engaged in the implementation process. But these governance dimensions of technical interventions/options have been unequally addressed in the case studies.

6.6 An operational framework building adaptive processes and institutions?

A social-ecosystem perspective emphasizes adaptation capacity: this perspective assumes that no changes can occurs in one sphere (the social system or the ecosystem) without adaptation and change in the other sphere. Moreover surprises and uncertainty are understood as an inherently component of the system. This means that there is not one possible solution to identified problem(s) as any interventions results in the evolution of the system that one cannot really anticipate. Moreover the system might need to readjust to external drivers in the same time or in the short term and this may impact on the adequacy of the "solution". In such a perspective what matters is less supporting the development an "adapted plan" but to develop the local institutional capacity to adapt and respond to change by adjusting plan and re-organize.

As underlined in the first part, different approaches are expected to facilitate adaptiveness (1) Adaptive management that is the experimentation of solution and adaptation depending of the impact (2) visioning and scenarios building (WP6 work) has also proved interesting to help organizations anticipate long term social economic and political changes by characterizing different possible future after identifying the main long term drivers of changes (3) Encouraging the use of simulation tools that allows exploring possible future under different types of scenarios in to encourage broader view of possible changes (4) capacity building and dissemination of related tools, approach and settings that facilitate the development self-organization skills and adaptation capacity.

It was not possible to develop the scenarios building exercise in all the case study and this approach could entirely be carried out in the two case study were the complex system approach was incompletely developed (Oum Zessar, and IND) – which were also the case studies that faced major political issues during the development of the project. Consequently the integration between the two axes has not been really tested.

As mentioned, the use of RPG social simulation tools allowed introducing and sharing complexity thinking with very different SH but time limits the number of scenarios they permit to explore. Yet as experienced in Afromaison, an autonomous large scale dissemination (providing adequate training and support) is possible and this might be a way to more systematically explore a larger variability of scenarios. This autonomous large scale dissemination would not have been possible with computerized tool at least in Africa with the limitation of technological and financial resources of many SH. WP7 has also been about the dissemination of tools and approaches for modeling and staging complexity as well as building local capacity in related methods and approaches in order to promote local capacity facilitating adaptation. This aspect has met unequal results in the different case studies and also brought interesting lessons for further development in this direction.

The process has indeed permitted to test and fine tune tools and to engage a large variability of SH in the production of plans. Beyond the elaboration of plans that will (partially) be or not implemented depending of the political will and ability to secure funding, this is expected to contribute to institutional formal or informal changes. The results are only incipient at the moment of the writing of this report andbut they are indication that the OF process has contributed to institutional changes that might impact ecosystem in the right direction (see box 2). The extent to which it has also facilitated the development of self-organizational skills and adaptation capacity remains to be assessed.

This is a current leading research questions. But it is not only a research imperative but a need for the development of adaptation as institutions must be able to analyze the systems state to adapt their plan if necessary. It includes assessing the external drivers and ecosystems dynamics but also organizing includes the prioritisation and processing of information during multi-stakeholders interaction in order to build an institutional memory of processes to facilitate decision making in further steps. This remains a challenge in most case studies when most of the discussion processes were not adequately capitalized.

Box 2 : Changes related to the process – example of Rwenzori CS

Thanks to the monitoring and evaluation protocol allowing making a procedural assessment of the participatory planning process, its context and its outcomes (See 5.4) (Ferrand and Daniell 2006b), a range of institutional changes could be observed. Even though direct link with the process cannot be claimed, it was certainly one of the drivers. Institutions are understood here in their broad sense, encompassing the normative and cognitive frames, formal or informal, to which stakeholders refer to when they make decisions. In that sense, an example of formal institution would be a law or a bye-law whereas an informal institution would be beliefs, social and cultural norms including relationships and behaviors. We advocate here that the participatory planning process, associated with role-playing-games, created favourable conditions for institutional change to occur.

In terms of **cognitive informal institutional changes** for example, in the Ugandan process, participants could voice and discuss their social norms and cultural beliefs. This is illustrated, for example, by the preference of small-holder farmers to cultivate deforested soils rather than their own fields while playing the game because forest soils are deemed to have a better fertility. Analysis of the process also revealed that it affected some of the beliefs of the participants through experience and knowledge sharing. For instance, while playing the game, one of the participants mentioned "I did not know that banana cultivation generated pollution".

Not only were there cognitive changes, but also **changes in terms of individual practices**. In some communities involved in the process, new individual practices could be observed both at individual (Ex: picking polythene bags from rubbish pits or building energy saving stoves) and collective level (creating a pit for abattoir and moving the washing bay in Kaserengethe or conservation of the partly reclaimed swamp towards Bulyanyenje).

Commitments of the stakeholders right after the process were high, regarding starting 'good' NRM practices (use of natural pests and disease control measures, hygiene and sanitation, etc.) or avoiding 'bad' practices (free grazing, cutting trees, bush burning, etc.). Several mention teaching others about the planning and the game processes and using them in their future work ("make concrete plans before doing any activity").

Certain **failures** were also observed, like in one area where a trench had been dug but not maintained, or in Busaru where one individual started a kitchen garden but mixed vegetables with many other species like trees and medicinal plants.

Another "type" of change which happened in the Ugandan process and which is closely linked to institutional change is **organizational change**. We understand here organization as a body of agents, a group of individuals, material entities that typically have personnel, offices, equipment, financial resources and often legal personality (Young 1989a, 1994a, North 1990). In the Ugandan case, a meso level regional organization called the Rwenzori Regional Development Framework (RRDF coalition of civil-society organizations), endorsed the strategy developed through the AfroMaison process. This group of NGOs is expected to coordinate and monitor the implementation of the plan. Implementation of the different actions of the plan should be split among the members of the RRDF depending on their scope of work (agriculture, water, education, etc.) while proposals for funding are to be submitted by the overall network. Such organizational changes may increase the chances of formal institutional change as such organizations can become "institutionalized" and self-sustaining.

7 Conclusion

The planning phase is a key stage in social-ecological system management as it is the moment when stakeholders can have the opportunity to engage with the future by taking decisions. In the operational framework for planning proposed by Afromaison, stakeholders' engagement is not sustained by a normative or ideological stance ("good governance or practices") or a pragmatic or instrumentalist one ("facilitating buy-in of the plan") but is a methodological consequence of adopting a social-ecological perspective which sustains that society cannot be disconnected from the ecosystem it controls and reciprocally. Monitoring and evaluation of the process have underlined that stakeholders truly engaged in the process thanks to the mobilization of a variability of tools, approach and settings to use them. The intense interactions between different types of stakeholders promoted primary forms of integration in most of the cases studies and transformative integration in some aspects in some of them

Innovation in the process went beyond the transfer of tools, or process for selecting tools and their mobilization in a multi-scale participatory setting: It also concerned the dissemination of an approach and intervention stance looking to operationalize the social-ecological system perspective. This was permitted by developing training and close support to local team along the project: one of the procedural challenges was to empower local teams so they could coordinate and develop the process in their own case studies as far as possible on their own.

Comparison of implementation in five case studies has underlined that, if the framework can be successfully operationalized for integrated natural management planning, there is still some margin of improvement. Thus integration remains perceived as a juxtaposition of actions, domains, actors and sectors. This perception put emphasis on trade-offs between elements while transformative integration can only results from the systematic exploration of existing links between elements. Some tools and use settings have proved particularly promising to explore these links but they timing of use and/or a preference given to analytical approach at some stage have not permitting to fully exploit their potential.

The work have underlined that integration can only be operationalized at case study level and by a proper planning of activities at local (that is with the relevant actors) level. As such, the challenge to integrate tools and approaches in the project frame reflects the challenges of integrated planning for natural resources management itself. The analysis of the work successes and shortcoming emphasizes the need for building the relational and technical capacities of the local team on which lies the concrete tasks of organization of a plurality of activities in order to be able to counteract the centrifugal forces of thematic agendas.

Indeed meso-scale should not be viewed as an administrative or a jurisdictional level but within the framework of polycentric governance as a network of institutions and organization having a mandate over a given territory which makes sense in term of natural resources management. The implementation of the operational framework implementation also underlined that multi-scale interaction that is the mobilization of organizations, actors and institutions intervening at different scale, inclusively at very local level is necessary and possible to make planning relevant. It supposes that to clarify the functions of the meso-scale level prior to any intervention as well as identifying the

operational linchpin(s) for planning and decision making concerning natural management in the system studied.

The implementation also underlined the need to improve the prioritization phase and some methodological orientation to do so have been proposed. Other improvements concern a clarification of the different roles of expertise in the process in the building of the plan notably in actions proposals, their specification as well as organization of the coherence of the plans

Monitoring and assessment has always been part of planning processes but the in social and ecological systems perspective adopted, the outcomes of the planning are as much the strategy proposed than the learning and reconfiguration of organizational and/or institutional arrangements along the planning process. This supposes to combine plan assessment with a proper monitoring and assessment of the process; We laid the basis for such an approach but it remains a leading research question which should also account for the extend for which the process did facilitate the development of self-organizational skills and adaptation capacities.

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PART 2 ANNEXES

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1 Annex 1: JUST-A-GRID tool

What is it?

Just-a-Grid is a tool used in a participatory planning process to assess participants' views on the principles or the priorities that should guide decision making. It is easy to apply and can be tailored to a large range of issues.

Why using it?

The purpose of the tool is to help participants of the planning process to reach an agreement on the main objectives of the process and on the principles that should guide decision-making.

For example if the issue at stake is the allocation of water among various stakeholders and sectors, the principles guiding the water allocation could be equality, seniority of rights, priority to the most disadvantaged, efficiency, priority to the environment, consideration of future generations' needs, consideration of past efforts in terms of water sparing

How should it be used?

It comprises 3 steps:

- 1) First individual participants are requested to rank statements on general decision guiding principles.

For example, in the case of water allocation, statements can be worded as follows:

- *In water allocation, everybody should be treated equally.*
- *Those who had water rights in the past should be able to keep them, even if there are new demands that cannot be satisfied.*
- *Regarding access to water, the most disadvantaged users should get priority on others.*
- *Water should be allocated to the most efficient or effective producers because they use it at best and it can benefit the whole community through jobs or taxes.*
- *The water needs of the environment should be satisfied.*
- *Our children and future generations should be able to undertake at least the same activities as us.*
- *Those who have made efforts to spare water in the past should be favored.*

- 2) An individual allocation exercise: Each participant is then presented with a scenario consisting in sharing a limited resource among various types of users. The arguments presented by each user are described; they can be related to some of the general principles presented in the first step. The total amount of resource requested by all users is higher than the available resource. The participants have thus to make trade-offs between users' demand and justify their choice. An example of such a scenario is provided below.

- 3) A collective decision-making exercise: participants gathered in small groups should agree on a common sharing of the resource and argument their choice.

Based on the comparison of the outcomes of each step, the tool allows 1) analyzing the heterogeneity in individual ranking of decision principles, 2) assessing the differences between general principles of allocation and the principles used in a specific situation; and 3) to evaluate the differences between individual participant positions and collective decision.

At which spatial scale?

Just-a-Grid can be used at various scales from the community level up to the meso or even national levels, depending on how the planning process is organized.

At which step of the planning process?

Just-a-Grid is typically used in the visioning and scenario building phase (phase 1.2) to reach an agreement on the objectives of the planning process. The allocation grid itself can also be used in other phases, for example to prioritize actions (option integration phase) or the allocation of resources (financial, social, human, etc.) between several actions (Option integration or Designing implementation plan).

Who should use it?

Just-a-Grid can be used by the person(s) in charge of facilitating the participatory planning process. Despite being quite easy to use, it may require some facilitation skills during the collective decision exercise to allow every participant to express its views and avoid some stakeholders imposing their power. The definition of initial allocation and requested future shares of the resource needs some calibration to trigger discussion between participants.

2 Annex 2: ACTION MODELING & MODEL

What is it?

A protocol and a template to support any stakeholder in formulating and sharing proposals for new actions for natural resources management, when co-designing an integrated management plan. It combines a formal structure (a knowledge model), an elicitation protocol, and some dedicated tools, paper based or on computer.

Origin

This action model follows a very classical functional input-output framework, including material and immaterial resources. It is based on actions' models used in agency representation for organizations and multi-agent models (Simon, 1977; Von Martial, 1990¹⁷). It has been evolved and integrated by IRSTEA in several applications since 1997, for participatory modeling and participatory planning.

Description of the participatory modeling process

The actions' modeling process is a critical activity where stakeholders are personally required to project themselves into actions, elicit options' proposals and deliberate on them. The rationale is to facilitate normative claims like "we should..." or "they must...", but to structure them so that they can be argued and integrated in common action plans (cf. COOPLAN integration). It also contributes to the participatory modeling process and the common game design protocol using Wat-A-Game, which allows for sequential integration and test through COOPLAN and Wat-A-Game, with the same framework.

As it is specified and implemented in the Operational Framework, the following steps are normally proposed to participants during collective protocols:

0. The situation (diagnosis) and common aims have been discussed before.
1. Participants individually list actions' proposals (name, short description)
2. They share (publish) their lists which are aggregated
3. They individually or by small groups detail each action's proposal using the action's model (paper or digital form). Outcomes are published. The set of action can be classified in terms of targeted scale, implementers and topic.
4. Each action's proposal can be discussed and modified using a "market plaza" approach, or "speed debating", where each proposer meets some others and they amend together the description. Consensus is not imposed.
5. Actions' proposals can be submitted and reviewed by external experts (scientific, technical), who feedback to the group.
6. Final version is agreed, mutualized and disseminated for further actions.

The resources and impacts' dimensions used can be agreed a priori or re-aggregated a posteriori based on the actual list of actions.

At the end of this process, these actions can be used either for participatory planning in the COOPLAN integration matrix, or for building model and games with Wat-A-Game. A joint knowledge management protocol can be set.

¹⁷ Simon, H. A. (1977). The structure of ill-structured problems. In *Models of discovery* (pp. 304-325). Springer Netherlands // Von Martial, F. (1990). Interactions among autonomous planning agents. *Decentralized AI*, Demazeau, Muller, Eds, 105-119, North-Holland.

The action's model

Actions are described in terms of:

- the resources needed to start and implement them, which can be of material nature (e.g., water, soil, money, labour, capacity building) or more immaterial such as political will and citizen acceptance,
- their different types of expected impacts (environmental, economic, social, governance) at different levels (individuals and households, communities, district, region), which should align with the initial normative choice of participants
- the level at which they should be implemented (household, village, district, watershed, region, nation),
- which actor is proposing it, the author of the proposal,
- their temporal term of implementation (short, mid, long term),
- the risks and uncertainties associated with them, the needs for additional information, and
- the necessary incentives to achieve them.

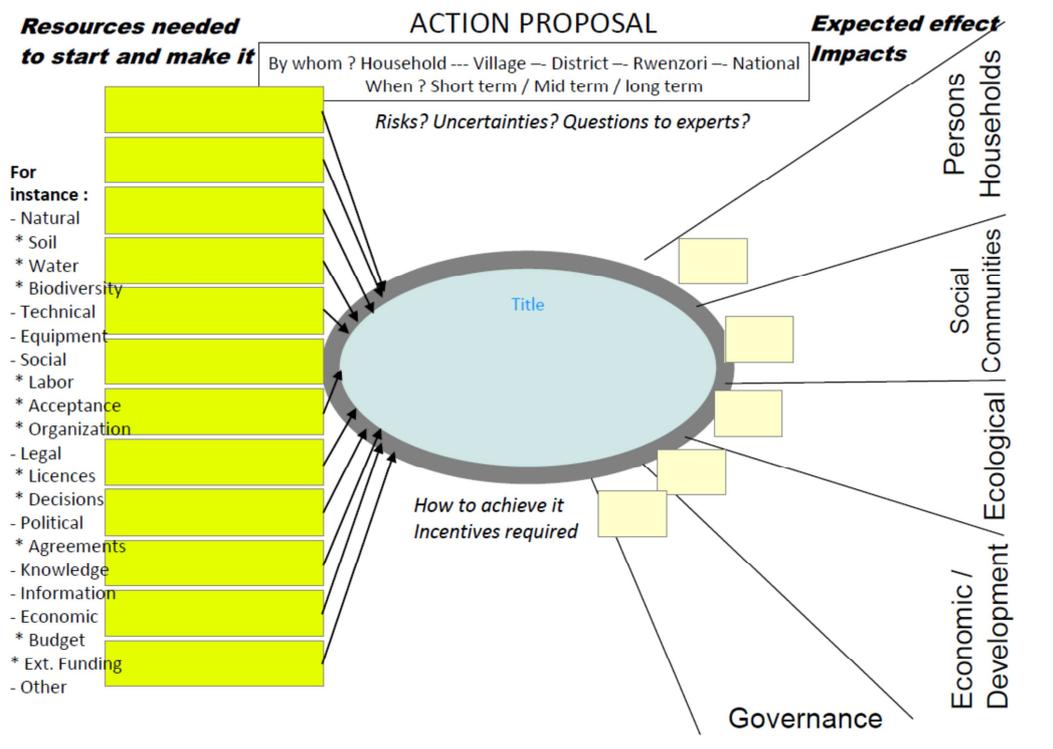


Figure 15 : A sample action sheet (Source : Ferrand, N., 2012)

Why using it?

To support participants of the participatory process to explicitly describe the actions they would like to see included in the plan and discuss them with others. It is a way of collecting stakeholders' knowledge about natural resources management options, and to confront them to the various visions. A uniform model allows for later integration and comparison.

How should it be used?

The process can be adapted but the main stages of individual formulation under a joint framework followed by a collaborative improvement, and a global organization, should be kept.

The timing of the actions' proposal can be between ½ day to almost one year, and can be supported by external facilitators or even interviewers who come and extract proposals from individuals before gathering them. Side groups can meet to discuss some specific options, especially with experts.

As much as possible the action sheet should be translated in the local language, and can be made graphical.

During a stakeholder workshop, each participant should be encouraged to propose one or several actions. It's critical to push them to reflect both on what they themselves should or would like to do, and what they would like others also to do. The initial focus on "me" is a good start.

The action sheets can then be initially or later digitalized to ease their handling, reading and further integration.

Information from the action sheets is then compiled into a spreadsheet or a database to inform the next steps of the process, either for planning or for participatory modelling with Wat-A-Game. This structured database of actions should be seen as a working document, evolving as the process unfolds. This information can later be further specified or revised using expert knowledge. (see Annex 4).

At which spatial scale?

Action sheets can be elaborated at various scales from community level up to national or transboundary level.

At which step of the planning process?

Actions sheets are built during the action proposal phase, but are then used later in the option selection and integration phase, or in the participatory simulation stages. They can be referred to in the procedural planning stage.

Who should use it?

It can be used by anyone, including illiterate lay person, all stakeholders, decision-makers or experts participating to the planning process. It does not require any specific skill or expertise.

3 Annex 3: COOPLAN Matrix

What is it?

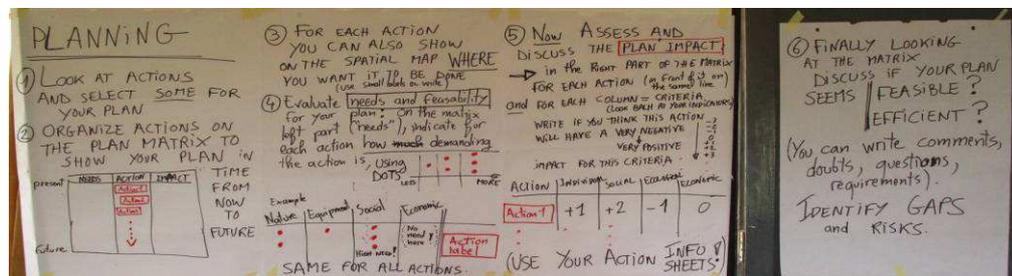
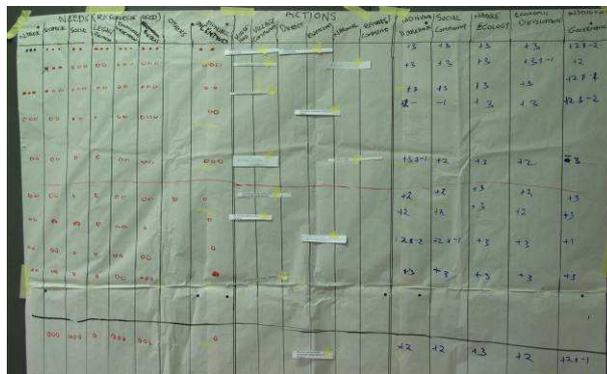
The COOPLAN integration matrix is a participatory tool used in the INRM planning process to select actions and integrate them into a strategy / plan.

Why using it?

The first purpose of the matrix is to assess the feasibility of the strategy / plan by checking that the total requirements of all actions in terms of resources do not exceed the capacity of actors and implementing organizations. The second objective is to identify the potential contradictions or synergies between actions by comparing their impacts with the objectives of the strategy.

How should it be used?

The COOPLAN matrix is a large table on a flip chart which columns headings display the same information as the action sheets (see Annex 1): needs on the left hand-side and impacts on the right hand-side. Participants to the strategy building workshop place their chosen actions on the matrix, starting with those that should be implemented in the short term at the top of the table. They can use post-it notes or visual cards to represent the actions. The matrix can be used in association with a map to indicate where the action should/could be implemented. The next step consists in assessing qualitatively (using dots or pebbles) the requirements of the chosen actions. Participants can refer to the action sheets or revise their initial assessment. One can use pebbles of different colours to represent the different kinds of resources (e.g. money, labour, skills & knowledge, political and individual will).



Photos: E Hassenforder

Some adaptations can be made if necessary: for example one can organize the actions into intervention domains addressing the main environmental stakes in the area. It can also mention organizations identified as role-players in the implementation of proposed actions, and challenges attached to interventions.

At which spatial scale?

The matrix is meant to be used mainly at meso scale. Quite often, when environmental stakes differ across different zones of the territory, it is recommended to build a plan for each zone.

At which step of the planning process?

The COOPLAN matrix should be used in the option integration and strategy building phase (phase 3) of the operational framework.

Who should use it?

It can be used by any stakeholder, decision-maker or expert participating to the planning process. It does not require any specific skill or expertise from the participants. Good facilitation skills are recommended to allow every participant to effectively contribute to the elaboration of the matrix.

Where does it come from?

The COOPLAN integration matrix was developed by Nils Ferrand (Irstea, UMR G-eau) under the project AQUASTRESS

4 Annex 4: Wat-A-Game Platform / CREAWAG

What is it?

Wat-A-Game (WAG) is an open toolkit and a method based on simple bricks and supporting software for designing and using participatory simulations (i.e. role playing games) for water management, policy design and education. It can be easily used in different cases, at different scales and for various water related issues. The toolkit offers 4 incremental implementation levels: an abstract game (INIWAG), a directory of reusable WAG games and model (WAG-LIB), and methodological guides to model your own local case (CREAWAG).

Wat-A-Game is also a community of users, creators and trainers which is animated through the website www.watagame.info

WAG is an instrumentalization of the companion modelling approach which advocates for the use of modelling and simulation in iterative sessions to mediate exchanges between and within groups of stakeholders and scientists.

Why using it?

Involving a group of stakeholders in the participatory modelling of water dynamics, use and management in their catchment has multiple virtues. First stakeholders engaged in participatory modelling have to agree on the elements which are staged in the model. It means they have to consistently express and debate their point of views and knowledge. It means this activity is a good way to bring together heterogeneous perspectives on the system: scientific vs technical vs empirical, upstream vs downstream, administrative vs politic vs economic, local vs regional.... Furthermore guiding a group of stakeholders through the process of conceiving their own simulation of their catchment is a good way of building habits of collaboration.



PICTURES : WAG modelling session during an AFROMAISON training (Medenine, Tunisia), testing a WAG prototype during a training session (Addis-Abeba, Ethiopia), stakeholders around the final WAG DIN game (Ouagadougou, Burkina Faso) – © Nils Ferrand, Géraldine Abrami

WAG has been conceived to ease and guide such a process so that it can be easily appropriated by institutions in charge or willing to animate natural resources management within a water basin.

A WAG game shows explicitly how water flows, is polluted, shared, and used. Participants can decide among various actions for themselves and the community, with consequences on their household economy, their satisfaction, labor, and the surrounding ecosystems. New policies can be invented and tested. It can be easily adapted to local cases, for various water and other natural resources (forest, biodiversity etc) issues. It means that stakeholders involved in a WAG participatory simulation are brought to get an understanding of the big picture, focusing on the interdependencies between each other and the natural resources, as well as understanding each other values and constraints. Furthermore being a player in a role playing game allows testing options in a safe environment, as well as stepping aside and being creative.

How should it be used?



Wat-A-Game is basically a bag with different kinds of cards and pebbles.

The cards represent river segments, hydraulic connections, dams and land plots. They can be assembled to create a map of the river basin exhibiting the structural hydrological elements and places of water use.

The pebbles represent resources (clean water, dirty water, money...) that can be circulated within this map to simulate water dynamics and use.

CREA-WAG is a methodology which guides the group through : the framing of the questions that they want to tackle, the design of the map, the identification and mapping of the stakeholders and activities impacting and impacted by the issue, the specification of roles and action cards used for simulating this system, the calibration of the roles and action cards parameters (needs and outputs) and of stressing scenarios, the making of a prototype, the organisation of sessions and the debriefing.

At which spatial scale?

Any scale -> basin scale good for working on interdependencies between different part of territory, community scale good for working on livelihoods and inequalities. The game can be crafted at one scale and played by stakeholders of different scales

At which step of the planning process?

The role playing game based on the WAG platform can be used at different stages of the planning process: for the diagnostic phase as the building (modelling) and simulation contribute to better understanding of the functioning of a social-ecological systems, in the

action identification phase as a way to identify possible issues and enhance brainstorming , in the refining stage or its assessment phase of the strategy as a way to test the strategies

Who should use it?

Any stakeholder, decision-maker or expert participating to the planning process can be involved in a WAG modeling or simulation session. It does not require any specific skill or expertise from the participants.

However the animation of a WAG session requires good facilitation skills and a good knowledge of the local situation to be able to challenge the participants and allow everybody to express themselves. The animation of the modelling sessions and the development of the game itself requires some modelling skills.

Where does it come from?

The WAG toolkit was developed by a group of researchers from UMR GEAU over several research projects, including AFROMAISON, and many training sessions.

5 Annex 5: Practice sheet used in Fogera first stakeholder workshop

ANNEX 3. "PRACTICES SHEET "

የድረገጽ ስም
Name of practice

አስፈላጊ ግብዓቶች
Resources needed

በማን ተግባራዊ ይሆናል?
Implemented by whom?

በምን ደረጃ ድረገጽ ተግባራዊ ሊሆን ይችላል?
At what scale?

በብተሰብ ደረጃ Household	በቀበሌ ደረጃ Kebele	በክልል ደረጃ Regional
በመካደር ደረጃ Village	በወረዳ ደረጃ Wereda	በፍደራል ደረጃ National

ሙቹ ተግባራዊ የሆነው?
When?

በከረምት ወቅት Rainy season	ልላ Other
በብጋ ወቅት Dry season	በማንኛውም ጊዜ Anytime

ከድርገት የምጠበቀው ልምት Expected impacts	ለምሳሌ (ለምን) Describe
በኮይባይና ሕይወት ስርዓት Biophysical	
ተቆማዊ ስርዓት Institutional	
ሙሉ ደረጃ ላይ Livelihoods	
ሌላ Other	

ሙቹ ነው የድረገጽ ልምት የሚታየው?
Expected time of impact

በአጭር ጊዜ Short term	በመካከለኛ ጊዜ Mid term	በረጅም ጊዜ Long term
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Source: First Fogera stakeholders' workshop, 12-14 December 2012. IWMI, ILRI, UMR G-eau. AFROMAISON Working document.

6 Annex 6: Example of action sheet used in Oum Zessar

(Source: Sghaier *et al.*, 2014)

PAIPBVOZ

Fiche d'Action 2

Intitulé : Réalisation de travaux de Conservation des Eaux et des Sols (CES) dans le bassin versant d'oued oum zassar et de leurs impacts

Justificatifs :

- Demande sociale
- Valoriser le savoir faire des propriétaires des terrains en pente du bassin versant
- Existence de potentialités de réaliser de nouveaux aménagements de CES ainsi que de réparer et de renforcer les anciennes réalisations

Objectifs spécifiques :

- La lutte contre l'érosion hydrique et la mobilisation des eaux de ruissellement
- La protection des ressources naturelles
- La contribution au développement agricole régional par la mise en valeur des terrains situés en pente et menacés par l'érosion hydrique
- La contribution à la recharge des nappes
- La maîtrise du ruissellement et l'épandage des eaux des crues
- La contribution à l'amélioration du niveau de vie en milieu rural par l'emploi de la main d'œuvre locale sous forme de chantiers pour la réalisation de certains travaux manuels de CES

Lieu / Localité :

Ces interventions concernent pratiquement tout le territoire du bassin versant d'oued oum Zassar de l'amont à l'aval relevant des délégations de bénikhédache, de medenine nord et de sidi makhlouf

Composantes :

Composantes	Quantité	Unité	Prix Unitaire (DT)	Cout Total (DT)
Confection et réhabilitation d'ouvrages de CES (tabias, jessour, seuils en pierres sèches, cordons,...)	3,000	ha	500	1.500,000
Comblement et la restauration des ravins	10,000	m3	1,0	10,000
Acquisition de plants fruitiers pour consolider et valoriser environs 1000 ha de terrains aménagés (ha)	20,000	Plant fruitier	5	100,000
Réparation, réhabilitation et renforcement des anciens ouvrages de recharge et d'épandage	25	ouvrage	12,000	300,000
Réalisation de nouveaux ouvrages en gabion pour la recharge des nappes (avec nécessité d'une étude de faisabilité)	10	ouvrage	35,000	350,000
Total	-	-	-	2.260,000

Durée :

Selon l'expérience des années antérieures en travaux similaires on estime que ces différentes interventions de conservation des eaux et des sols sont réalisables en cinq (5) années après bien entendu que l'étude d'évaluation des aménagements de la conservation des eaux et des sols (CES) déjà enregistrés dans le bassin versant d'oued oum zassar et de leurs impacts soit élaborée.

Echelonnement dans le temps : Logiquement et normalement cette étude doit être élaborée durant la première année avant même l'entrée en œuvre de l'exécution du plan d'aménagement pour justifier davantage l'opportunité technique, socio-économique et environnementale des différentes actions d'aménagement proposées.

Composantes	Quantité totale prévue	Echelonnement d'exécution dans le temps				
		Année 1	Année 2	Année 4	Année 5	Année 6
Confection et la réhabilitation des ouvrages de CES	3.000 ha	600	600	600	600	600
Comblement et la restauration des ravins	10.000 m3	2000	2000	2000	2000	2000
Acquisition de plants fruitiers pour consolider et valoriser environs 1000 ha de terrains aménagés (ha)	20.000 plants fruitiers	4000	4000	4000	4000	4000
Réparation, réhabilitation et renforcement des anciens ouvrages de recharge et d'épandage	25 ouvrages	5	5	5	5	5
Réalisation de nouveaux ouvrages en gabion pour la recharge des nappes (avec nécessité d'une étude de faisabilité)	10 ouvrages	-	-	5	5	-
Réalisation d'épis en gabion pour la correction des méandres	10 ouvrages	-	2	3	3	2

Ressources nécessaires :

Naturelles	
Eau	-
Sol	-
Biodiversité	-
Techniques	Nécessite au moins 1 Ingénieur ou 1 Technicien Spécialisé en CES ou en GR ou en Aménagement Hydraulique pour le suivi et l'encadrement de la bonne exécution des interventions proposées
Equipement	-
Social	-
Travail	-
Acceptabilité	-
Organisation	Nécessité d'organiser la population du bassin versant pour faciliter la valorisation des aménagements antérieurs et l'exécution des nouvelles interventions proposées
Légal	
Licence	-
Décision	-
Politique	
Accord	-
Connaissance	-
Information	-
Economique	
Budget	Les actions d'aménagement de CES proposées demandent certainement un important budget pour les exécuter
Finance Externe	A notre avis ça ne demande pas de financement extérieur supplémentaire aux projets et programmes en œuvre actuellement dans le gouvernement
Autres	-

Financement :

L'intervention en matière d'aménagement du bassin versant d'oued oum zassar par des travaux de CES est continue annuellement et le financement se fait sur les fonds du programme national des travaux de CES puisque ce bassin versant est considéré comme étant une zone d'intervention de première priorité.

De ce fait, et compte tenu aussi que ce bassin versant est concerné en majeure partie par les interventions du Projet de Gestion des Ressources Naturelles (PGRN2) on considère que les différentes actions de CES proposées dans le cadre de la présente étude relative à la préparation d'un plan d'aménagement et de développement intégré et participatif du Bassin Versant d'Oued Oum Zassar (PDPI) peuvent être financées totalement sur les crédits du Programme National de CES et du PGRN2 sans oublier les encouragements du programme FOSDAP

Impacts :

Economique :

- La lutte contre l'érosion hydrique et la mobilisation des eaux de ruissellement
- la contribution au développement agricole régional par la mise en valeur des terrains situés en pente et menacés par l'érosion hydrique
- la contribution à la recharge des nappes
- la maîtrise du ruissellement et l'épandage des eaux des crues

Social / Communauté :

- l'aménagement, la réhabilitation et la valorisation des ouvrages de CES par les plantations fruitières vont contribuer certainement à l'amélioration du niveau de vie des habitants du bassin versant.

Ménages/individus :

- les interventions proposées vont alléger notamment le phénomène d'exode rural

Environnemental :

- les interventions proposées vont contribuer à la protection des ressources naturelles par la réduction des pertes en sol et en eaux de ruissellement

Institutionnel/gouvernance :

- Un tel projet basé sur l'approche participative et intégrée va entraîner une meilleure organisation de la population exploitante du bassin versant concerné

Bénéficiaires :

Cette étude concerne l'évaluation et de l'inventaire des aménagements de CES enregistrés dans tout le territoire du bassin versant d'oued oum Zassar de l'amont à l'aval relevant des délégations de Bénikhédache, de Médenine nord et de Sidi Makhlof.

7 Annex 7: Challenge and operational learning in the procedural assessment

M&E TOOLS	CHALLENGES & DIFFICULTIES IN THE IMPLEMENTATION (PROCEDURAL)	CHALLENGES & DIFFICULTIES IN THE M&E (SUBSTANTIVE)	OPERATIONAL LEARNING
Logbook	Lack of involvement and regularity of the steering team in filling in the logbook Poor internet connection, high cost and steering team not always acquainted with the use of computers	Sessions ID non-automatised so difficulty to make the link between the various M&E tools and their origin (place, date)	Constant follow-up with the steering team mandatory (by phone or field visits) to make sure that the logbook is filled in Use of excel files accessible offline to compensate the poor internet connection > the best would be to have on-board questionnaires that the steering team and rapporteurs could fill in offline on their computers or tablets. Training of the steering team and rapporteurs on basic computing
Attendance list		Participants do not always use the same family name: individual longitudinal tracking difficult	The analyst must be familiar with the stakeholders' networks of concern or link up with a focal person who is.
Pictures and videos	No video analysis (lack of time and resources)		Pictures of the documents (monitoring tables, participants' evaluation sheets, facilitators' debriefing sheets) in order to leave the original documents with the groups who produced them.
Participatory observation		Difficulties in the identification of the participants when the observer does not know the group of concern.	First identification based on physical appearance (« man with the green shirt ») cross-checked later using pictures and knowledge of the steering team.
Questionnaires		During the first workshop, in an anonymity purpose, it was not asked to participants to write their names on the questionnaires. However, without names, an individual tracking of the evolution of the expectations, learning, etc. is impossible.	Include a « name » cell on the questionnaire and explain to participants that the anonymity of the responses will be kept. Check when collecting questionnaires that names have been written on each.
Facilitators' debriefing notes (meso)	Most facilitators do not take notes, no M&E, data collection or data analysis culture.		
Rapporteurs' debriefing notes	Rapporteurs and steering team do not always have M&E or participatory observation skills. Autonomisation and transfer with all self-evaluation risks it includes		Training of the rapporteurs to participatory observation principles Triangulation of the data collected

M&E TOOLS	CHALLENGES & DIFFICULTIES IN THE IMPLEMENTATION (PROCEDURAL)	CHALLENGES & DIFFICULTIES IN THE M&E (SUBSTANTIVE)	OPERATIONAL LEARNING
Participants' evaluation sheets	Low-tech context Low literacy and education levels (at the local level up to 50% of the participants are illiterate)	Tendency to be willing to « satisfy » the evaluator rather than express one's opinion Binary rather than graduated evaluation (participants check either the maximum or the minimum on the Likert scale but no in between) Same problem for the names than for the questionnaire	Paper-based evaluation, not requiring pens, use of tablets by the rapporteurs to take pictures of the process and outcomes Use of symbols, no or few text. Involving the steering team in the conception in order to choose the appropriate symbols and formulation. Detailed and repeated explanation to the participants on the objectives and raison d'être of the M&E protocol and on how filling in the tools: we assume that repetition will foster greater critique from the participants (to be confirmed or infirmed during the data analysis) Reformulation of the questions in a more open manner ('to what extent... ») but it did not solve the problem (instead of answering « yes », many answer « to a great extent »)
Facilitators' debriefing sheets	Tendency to write only the minimum and to answer in a binary manner (Yes/No)	Certain variables less addressed than others in interviews (social justice/equity, relations among the stakeholders). Specific tools had been conceived in the « ENCORE » theoretical framework (Ferrand, 2004) (cognitive mapping, participatory network analysis, etc.) but it was time-consuming and difficult to implement with facilitators and translators ignorant of these techniques. Difficult tracking of internal and external causality: no clear distinction between the changes linked to the process (endogenous causality) or to other external contextual elements (exogenous causality).	In-depth interviews with team members, participants and non-participants, accentuating on causality. In-depth study of the context (Byrne, 2013) Importance of defining the boundaries of the object of focus (« boundary judgments ») (Ulrich 1983, Midgley 2000) and cross-views to enlarge the scope of vision.
Interviews	Choice of the appropriate format for feedback (Newsletter/ Video)? Transferability of the M&E protocol post-intervention: will the process M&E and its impacts set the basis for the future M&E of the implementation of the plan and its revision?	Importance of the evaluation of the impacts of the feedbacks on the process itself (« evaluating the evaluation »)	Choice of a poster format to feedback to the communities and oral presentation for the meso-group. Possibility to partner with a local organization/network (Rwenzori Information Centers Network <i>RIC-NET</i>) raised but not implemented Integration of M&E actions in the plan Use of clear and short messages towards decision-makers ("policy-briefs")

8 Annex 8: Game uses for ex-ante assessment of the strategies

	Rwenzori	Fogera	DIN	uThukela
Meso-scale	<p>1/ Planning process: Outcomes = 3 plans (3 groups)</p> <p>2/ First game session “business as usual” + debriefing</p> <p>3/ 2nd game session “test of the plans” + debriefing</p> <p>3/ Modifications of the plans according to the outcomes and learning of the 2nd game session</p> <p>4/ merging of the plans into one</p> <p>Nb of repetition : 3 for meso scale but group differed slightly,</p>	<p>1/ First game “business as usual” + debriefing</p> <p>2/ Planning process using game items (game board, pebbles). Outcomes = 2 plans (experts & farmers)</p> <p>3/ Review, refocusing and merging of the plans</p> <p>4/ 2nd game session “business as usual” + debriefing</p> <p>5/ Micro game session “business as usual” + debriefing on the heterogeneity of constraints between and within the landscapes</p> <p>6/ Discussion on plan implementation based on the outcomes of the previous game sessions</p> <p>Nb of repetition 1 (different groups)</p>	<p>1/ Planning process: Outcomes = 3 strategies (technical / agronomic / social)</p> <p>2/ First game “business as usual” + debriefing</p> <p>3/ Planning process – merging and enrichment of strategy</p> <p>4/ Second game “test of the plans” + debriefing</p> <p>5/ Planning process : refinement an implementation constraints of the plan – no link with the game session</p> <p>Nb of repetitions : 1</p>	<p>Used to test and assess various institutional mechanisms to facilitate coordination between zones.</p> <p>One game session with different options in each round, followed by brainstorming</p> <p>1/ Round 1 : Business as usual</p> <p>2/ Round 2: single representation body</p> <p>3/ Round 3 joint of existing association</p> <p>4/ Round 4 localized committees with external integrator</p> <p>Ending with recommendation of joining existing associations and organization</p> <p>Nb of repetitions : 1</p>
Local Scale	<p>1/ First and second game session “business as usual” + debriefing</p> <p>2/ 3rd game session “suggesting actions” + use actions from meso-scale strategies</p> <p>3/ 4th to 6th game sessions “repetition and refinement of the list of actions”</p> <p>4/ Formalizing community strategy</p> <p>Nb of repetition 2 -7, 31 villages-</p>	<p>No session at local scale but the micro game was meant to address local scale issues</p>	<p>No session at local scale</p>	<p>One game session with different users group (business as usual) integrated with a workshop to assess perceptions concerning environmental issues and possible solutions RPG was used to enhance shared understanding of system functioning and prepare for deeper assessment and analysis of existing interventions and participatory mapping</p> <p>Nb of repetition : 6 (different types of users groups)</p>

9 **Annexe 9: WP7 synthesis by case study team - Oum Zessar**

WP7 FINAL SYNTHESIS AND COMPARISON OF CASE STUDIES: INFORMATION PROVIDED BY TUNISIA CASE STUDY

20/11/2013

ACRONYMS AND ABBREVIATIONS

ACCCA	Advancing Capacity to Support Climate Change Adaptation
CC	Climate Change
CS	Case Study
DESIRE	Desertification Mitigation and Remediation of Land
DESURVEY	Surveillance System for monitoring, forecasting and bridging for prevention and mitigation of desertification
DST	Decision Support Tool
DeMAX	Design Matrix
ES	Ecosystems Services
ESS	Ecosystems Services System
GAD	Group for Agricultural Development
GIS	Geographic Information System
IRA	Institut des Région Arides-Medenine (Institute of Arid Regions)
ICRAF	World Agroforestry Centre
INRM	Integrated Natural Resources Management
IPDP	Integrated and Participatory Development Plan
LADA	Land Degradation Assessment in Drylands
LPCD	Local Plan to Combat Desertification
LUPIS	Land Use Policies and Sustainable Development
MESD	Ministry of Environment and Sustainable Development
NGO	Non-Government Organization
NRD	Desertification Research Center(Nucleo Ricerca Desertificazione)
NRM	Natural Resources Management
NRMP	Natural Resources Management Program
ODS	Office Development in South
OSS	Sahara and Sahel Observatory
OZ	Oum Zessar
PPGIS	Public participation geographic information systems
CRDA	Commissariat Régional de Développement Agricole (Regional Office for Agricultural Development)
ROSELT	Réseau d'Observatoires de Surveillance à Long Terme (ROSELT)
SASS (French)	Système Aquifère Septentrionales du Sahara Septentrional (North Western Sahara Aquifer System)
SIEL	Information system for Local Environment
STH	Stakeholders
SWAT	Soil and Water Assessment Tool
SWC	Soil and Water Conservation
TWG	Thematic Working Group
UNITAR	United Nations Institute for Training and Research
WAHARA	Water Harvesting for Rain-fed Africa
WAHIA	Water Harvesting Impact Assessment
WB	World Bank
WEAP	Water Evaluation And Planning
WP	Work Package

I. General introduction

The watershed of Oued Oum Zessar is located in the South of Tunisia (Governorate of Medenine). Provided its dense hydrologic network, Oued Oum Zessar is considered one of the largest and most important basins in Tunisian Djeffera (area: 350 km²; perimeter: 151 km). It is divided into two major zones: the Jebel or Matmatas and Jeffara plain divided itself into three territorial areas: Sidi Makhoulouf (upstream), Northern Medenine (Piedmont) and Beni Khedache (downstream).

Given its geographical position, the site of Jeffera is characterized by an arid Mediterranean climate. It receives very little precipitation (an average annual precipitation of less than 200 mm with only about 30 rainy days). The topography of the watershed is low and dominated by mountains, with remarkable variations in climate, vegetation cover and facies that could be seen over a short distance.

The area of Oum Zessar watershed has witnessed profound changes for about a century which has greatly affected the social and economic dynamics of its local communities (settlement, land privatization, decline of agro-pastoralism and agricultural development, agriculture modernization and changes in use patterns and use of pastoral space, access to and use of natural resources). All these registered changes have seriously altered the traditional ways of life and forms of adaptation of local communities to the arid climate and greatly transformed the landscape in the arid zone.

Rangelands have gradually shrunk to give room to private farming systems, water and soil conservation activities (creation of new lands and more valorization of rainwater) and the expansion of irrigated areas. But, the irrigated agriculture sector faces severe problems of salinity and water tables depletion.

All the mentioned changes have resulted in an increase in the use of natural resources especially within the current situation of the increasing needs of local communities and the climatic, socio-economic, institutional and political condition. Thus, these natural resources consequently became increasingly vulnerable, a fact better confirmed by water and wind erosion observed in the region (Fetoui, 2010).

Big efforts are being made by national institutions and local communities with support from international and sub-regional organizations for a sustainable management of natural resources in the basin.

II. Meso-scale in Tunisia CS

1. Definition

In Tunisia case study, the meso-scale covers the district of Medenine Oum Zessar Watershed, which spreads over three administrative delegations.

Table 1 – Tunisia: Administrative territorial division

Administration/State Structure		Representative body	Position, governance and responsibility
National	Ministry of Interior	Minister of Interior	Security - Promote Regional development
Regional	24 Governorates	Governor (Wali in Arabic): *Regional development councils	Governor (Wali in Arabic): Head of the governorate, appointed by the President of the Republic with recommendation from the Minister of Interior. He is the representative of the government at the head of the Governorate and is in charge of administrative and economic management. Regional development councils: They are in charge of the economic, social, environmental, cultural issues and concerns in their governorate. These councils manage the governorate's local affairs. They are chaired by the governor and composed of elected members, presidents of rural councils, and representatives of regional technical services.
Local	264 Delegations	Delegate *Local Development Councils	Delegate: is the state's representative in each delegation. He is appointed by the Minister of the Interior under the supervision of the governor. He is in charge of the local administration. Local Development Councils: The board is chaired by the Delegate; it is composed of the presidents of municipalities or municipal districts located in the delegation, the presidents of rural councils, heads of sectors (Omdas), and representatives of technical services at the local level. The local development council is in charge of the economic, social and cultural issues of the delegation.
Local	264 urban municipalities	Mayor	The municipalities: is also subject to political leadership provided by the City Council which oversees and sets policy and takes major decisions concerning the municipality's affairs. The main role of the City council is to manage local affairs and to decide on municipal issues.

*this was suspended in the current transition phase after the revolution of January 14, 2011.

2. Importance for INRM

Oum Zessar watershed is part of the Tunisian Jeffara - an area characterized by a low arid Mediterranean climate with an average annual precipitation of 160 -220 mm received over an average span of 30 days/year. Water availability is therefore considered one of the major constraints for pastoral, agricultural and domestic activities. The watershed is a typical agro-pastoral interlocked area with crop cultivation expanding rapidly in plain areas and marginal rangelands. The expansion of crop lands has had negative effects on native rangelands as native vegetation declines and animals have less space left for graze. Desertification is also a serious problem and an on-going phenomenon aggravated by anthropogenic pressures caused by the socio-economic change and population growth.

Oum Zessar watershed has the following key biophysical and socio-economic characteristics:

- i) degrading dry lands;
- ii) low rainfall;
- iii) scarce water resources;
- iv) accelerated expansion of rain-fed and irrigated agriculture of olive trees and cereals;
- v) high demand for irrigation;
- vi) mixed communal and private agrarian system;
- vii) rapid population growth and urbanization.

Table 2 - Relevance of Oum Zessar local context for AFROMAISON

Selection criteria	Specific context of Oum Zessar Watershed
Multi-functional landscape	Rain-fed agriculture mainly trees, irrigated crops, rangelands, livestock (goat, sheep, and camel), urbanization, agro food industry, production of building materials, tourism, service industry, border economic activities, transport, information/communication, etc.
It includes both protected and non-protected areas	protected areas under forest conventions, private land, communal land
Strong competition in the use of natural water resources.	<ul style="list-style-type: none"> • Water use competition among different sectors (urban, tourism, industry, agriculture). • Competition among upstream and downstream users, competition over groundwater, land resources access, privatization.
natural resources degradation	Wind erosion, water erosion, loss of biodiversity, salinization
High vulnerability	Aridity, drought, climate variability, poor soil
Strong local partners with good knowledge on pressing issues in INRM	<ul style="list-style-type: none"> • NGOs, local institutions, administrations, researchers, networks • Existing agreements between IRA, NGOs, local institutions and technical services
Established networks with stakeholders and authorities	<ul style="list-style-type: none"> • NGO network, scientific network, research/development network, partnership between actors. • Existing agreements and network between IRA , NGOs and local institutions and technical services
Recently completed and current projects	<p>Recently completed:</p> <ul style="list-style-type: none"> • Jeffara project (2001-2003)- NRM approach, multidisciplinary and systemic approach • WAHIA (2000-2002)- impact assessment of NRM, water allocation, CBA • SUMMAMAD 2002-2014- NRM, livelihood, • LADA- Livelihood, INRM, assessment, ACCCA/UNITAR , Vulnerability to CC, NRM <p>On-going:</p> <ul style="list-style-type: none"> • ROSELT/OSS- Desertification, NRM, dynamic, observatory, water management (SASS) • DESURVEY- NRM, multi-scale • DESIRE- INRM, multi-scale • LUPIS-Impact assessment of land use policies and NRM, multi-scale, inter-sectorial • WAHARA- Assessment of INRM, multi-scale • NRMP project (funded by the WB)
Total area between 5,000 km ² - 50,000 km ²	3,600 km ² - 20,000 km ² Meso-scale: from the watershed level to the governorate level

All these characteristics, among others, make the watershed highly vulnerable to the impacts of climate change and complicate the agricultural life of the communities to find a balance between their aspiration to improve their livelihoods on the one hand and their desire to protect the environment on the other. For this reason and in order to find a middle ground, a wide range of researches and surveys on agricultural and natural resources management were conducted to ensure the economic development of the region.

3. Choice of territory

As part of the Jeffara region, Oum Zessar watershed is rich with expertise and knowledge in terms of traditional and modern irrigation systems, rangeland management and tree crop plantation. . It is equally endowed with a relatively good physical and social service infrastructure (water, electricity, schools, health centers, roads, etc.), available non-farm sources of income, and vast private lands. However, the watershed faces many environmental and climate problems that hamper the development of the region namely scarce water resources and land degradation. Thus, Oum Zessar watershed in Tunisia would be an appropriate framework to examine Integrated Natural Resource Management (INRM). Because of both its favorable and unfavorable characteristics, Oum Zessar watershed is deemed to have met the selection criteria of the AFROMAISON study site. The corresponding criteria are as follow:

III. Context of the Operational Framework implementation

4. Presentation of the Implementation Context

The case study is coordinated by OSS and implemented in partnership with concerned national and local institutions, namely IRA and CRDA of Medenine. This partnership is consolidated by a specific collaboration agreement. On a technical level, the project is divided into thematic working groups (Forests and rangelands, Water Resources, Water and Soil Conservation (SWC), Agricultural Production (plant and animal) and Socio Economics / Economic Instruments). A steering committee regularly monitors all the activities of the project.

The approach adopted for the implementation of the operational framework, which is based on the methodological framework of the Afromaison project, is consistent with Oum Zessar's Watershed Integrated and Participatory Development Plan (IPDP). This adopted approach is (Figures 1 and 2):

- **Multidisciplinary:** it involves social scientists and biophysical sciences,
- **Collaborative:** it involves cooperation partners (OSS, partners of AFROMAISON project), scientists (IRA), and development partners (technical services CRDA, ODS, etc.) and local actors (NGOs, local people, etc.).The partnership between the partners has been strengthened throughout the development process of the IPDP;
- **Participatory,** as the civil society, the professional organizations base (GAD local Farmers Union, etc.) and local communities were involved in the IPDP development process since the first key stages of the project's implementation;
- **Integrated:** it strives to integrate the main dimensions and thematic biophysical and socio-economic aspects for an integrated management of natural resources management and SWC.
- **Multi- scale:** it takes into account different scales (upstream, downstream, piedmont, watershed, administrative areas, etc.).
- **Synergistic and capitalizing,** it aims to enhance and build on the achievements of existing projects, completed or in progress, and tighten up potential synergies between them...

5. Synergies: Afromaison Operational Framework & National Programs / National Partners Implication Mechanism

As represented in the two figures below, there exist multiple synergies between the AFROMAISON project and a number of other current and past projects in Oum Zessar watershed. The

AFROMAISON project teams in Tunisia work in close collaboration with stakeholders and other projects coordinators. National programs key actors were equally invited to the CS meetings. Small meetings were organized by a number of projects implemented at the watershed area. For instance, during the AFROMAISON consortium meeting in Djerba (April 2013), a one-day meeting was held and brought together the WAHARA and AFROMAISON projects partners for them to exchange and share information. The same kind of meeting previously took place within the framework of the Wadis-Mar project at the local level.

IV. Chronological Order of Oum Zessar CS Implementation

According to the AFROMAISON project’s conceptual framework, five main steps were devised for the implementation of the planning process (see table below).

Fig 1: Synergies between on-going and past projects

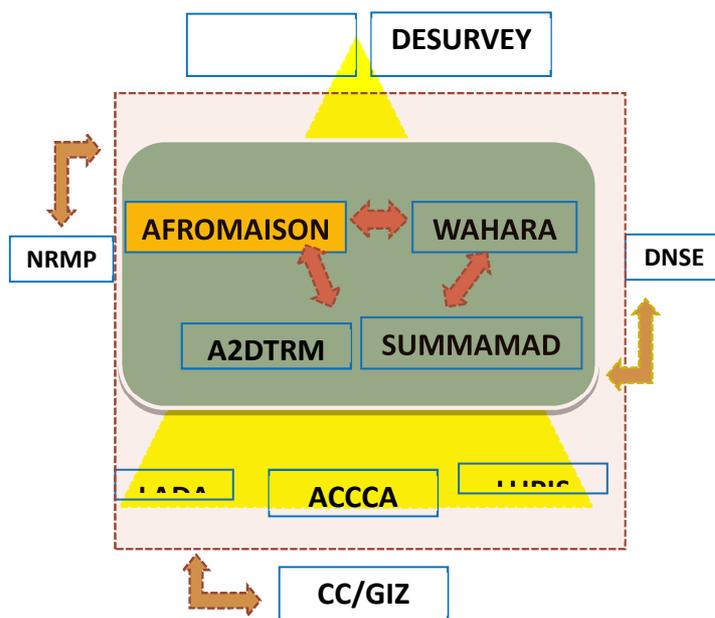
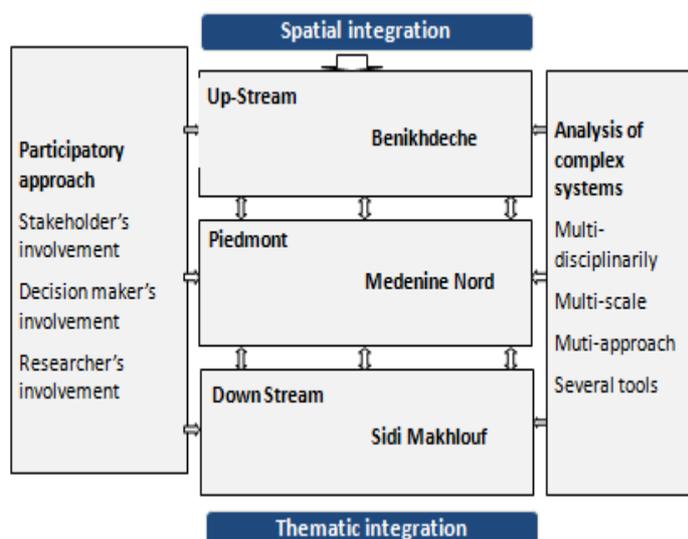


Fig 2: Integrated and participatory management approach



Step/ activity	Duration	Objective	Actors	Main contents	Main Outcomes	Social Outcomes	Connection with other activities
Design and agreement	6-10 June 2011 (IRA headquarter Medenine)	Site Identification Field Visit Awareness-raising campaigns (targeting stakeholders)	Bodies (OSS, IRA and CRDA)-local actors (Civil society, farmers, local technical services)	- Importance of an Integrated management of Oum Zessar's water resources	Inform local actors on the main objectives of the AFROMAISON project	Involvement of stakeholders and local communities Creating awareness on the INRM	To prepare for the national kickoff meeting
	13- 15 December 2011 (IRA headquarter Medenine)	National Kick-off workshop and identification of available NRM tools	OSS-IRA –CRDA Members, Regional Actors & Steering Committee Partners	- Presentation of the AFROMAISON project - action plan validation adapted to the local context for the development of an Integrated and Participatory Development Plan (IPDP) at Oum Zessar watershed - Identification of the available NRM tools in Medenine.	Commitment of the stakeholders to develop INRM plan in the Watershed	Social capital and cooperation among different local actors Creating awareness on the INRM	To Inform the stakeholders and local population on the objectives of the project.
	March & April 2012(IRA headquarter Medenine)	Additional activities: Small meeting with the implementation bodies	OSS-IRA , Bodies (ODS-CRDA-MESD)	feedback from the Bahar Dar workshop + synthesis in French	Information and validation, roles and involvement of actors and partners	Learning by doing and cooperation among different local actors	Availability of partners to participate in the CS activities

Situation assessment¹⁸	November 2011 (IRA headquarter Medenine)	Context analysis Diagnostic approaches presentation	Bodies (OSS, IRA and CRDA)-local actors (Civil society, farmers, local technical services) WP2 leaders (ICRAF)	Characterization of the site, presentation of the approaches to identify the challenges and opportunities offered. Selection and adaptation of an approach for OZ case study	"Rapid assessment" of OZ watershed.	Learning by doing and collaboration among stakeholders and national institutions	General Overview of OZ watershed case study (constraints, advantages, achievements, results , etc) to be used by other WPs and local technical services
	April 4, 2012 IRA headquarter Medenine)	Thematic Working Groups (TWG) Workshop and activities monitoring	IRA-CRDA , different development sectors Actors	Preparation of collected data and preliminary results Creation of thematic and territorial Working groups (TWGs). planning short-term activities and distribution of tasks	Short term action plan, commitment of TWGs leaders	Agreement and partnership	Linked to the activity of the of NRM tools assessment used in the case study site.
	January 2012- March 2013	Assessment of soil restoration and water harvesting tools Oum Zessar water balance survey	OSS-IRA-CRDA Bodies (Biophysical TWGs aspects) + Students	Inventory and characterization of soil and water conservation (SWC) activities , Additional Biophysical data collection Literature Survey Data collection for WEAP Data introduction and model Calibration. Water balance assessment in Oum Zessar using the WEAP model designed to introduce climate change data for scenarios testing	Involvement of students/capacity building, Analysis of biophysical collected data (SWC and water resources), WEAP model appropriation Preliminary results of the WEAP model application. Mapping of water balance components in Medenine.	Social capital and cooperation among different local actors	Linked to WP3, WP6 and WP7 activities

¹⁸ The situation assessment covers : Restoration – Adaptation – Water Harvesting (WP3) ; Economic instruments and incentives (WP4) ; Spatial Planning and tools (WP5)

May 2012- september 2013	Ecosystem services (ES) assessment	OSS-IRA-CRDA Bodies (Biophysical TWGs aspects) + Students	Identification of ES in Oum Zessar Qualitative assessment of ES using a scoring approach proposed by WP3 leaders and their mapping Data collec and quantitative assessment	Involvement of students/capacity building, Eleven (11) maps of ES based on qualitative aspects were elaborated	Social capital / and cooperation among different local actors	Linked to WP3 and WP5 activities
May 9, 2012 (IRA quarter Medenine)	Follow-up Workshop for the case study activities	Steering committee (IRA headquarter Medenine)	Presentation of collected data and preliminary results of TWGs	The available NRM and SWC were presented	Partnership and commitment of the actors	Recommendations for the rest of the activities
30 May 2012 (IRA headquarter Medenine)	Workshop for the feedback results of WP2 and main assessment (WP7)	OSS-IRA- CRDA Bodies , TWGs, Stakeholders WP7-WP2	Presentation of the WP2 results to Oum Zessar case study's stakeholders Presentation of the results representatives of WP2, WP3 and WP7 project obtained by the TWGs and territorial working groups with. Identification of opportunities for the integration of tools and options for the elaboration of INRM plan in Oum Zessar.	NRM data and inventory of water and soil conservation works were presented and discussed with the AFROMAISON partners	Learning and cooperation among different local actors	Linked to the training on "Platform game design"
29 May –8 June 2012 (IRA headquarter Medenine)	Training on "Platform game design" for the project (all case studies)	OSS-IRA , participants of the five case studies and WP7	Training session on participatory approaches "Water Game" was organized in IRA headquarter by the WP7 leaders	Participants (students and technicians) of each CS were instructed on the game design approach	Learning and partnership	Linked to actions and options integration activity for an INRM based on "WATAGAME"
24 May – September 2012 (IRA headquarter Medenine)	Oum Zessar Watershed pro SWCs for implementing the "WATAGAME" approach	OSS-IRA and local actors/ Stakeholders and WP7	<ul style="list-style-type: none"> - Initial workshop - Field work - Finalization of the model - Final field testing (to be decided where?) - Testing of the WAG method with the stakeholders 	The first phase of the game adapted to Tunisia CS was developed with the support of a student, Watershed functioning and integrated management of Natural Resources	Learning and partnership	Linked to actions and options integration for an INRM in Oum Zessar CS based on WATAGAME or other approaches

	March 2012-March 2013	Evaluation of local population Livelihoods and economic tools and incentives	OSS-IRA -CRDA Bodies (socio-economic TWG) + Students	Socioeconomic survey Field Data collection and Analysis Application of DST, DEMAX and impact and sustainability of the economic instrument and incentives in Oum Zessar	Elaboration of the Survey sheet Data collected on 120 households Report sent to the WP4 leaders Proposal to elaborate joint paper with other CSs.	Learning and partnership	Linked to WP4 activities and to Oum Zessar development plan,
	July 17, 2012 CRDA headquarter Medenine)	Consultation and follow-up workshop	IRA -CRDA -Actors	Identification and classification of Ecosystem Services (ES), SWC based on the approach proposed by the WP3 leaders. Evaluation of economic instruments and incentives based on the INRM model (WP4).	Classification of the appropriate ES in Oum Zessar case study	Learning and partnership	Linked to ES evaluation within the WP3 and WP5 activities
	February 2012 – September 2013	spatial planning tools Evaluation	OSS - IRA -CRDA Bodies (TWG) + Students	Fill in the questionnaire proposed by the WP5 leaders Use of Medenine agriculture map for ES qualitative evaluation Elaboration of a mapping model to simulate water allocation in the watershed	Report of the spatial planning tools in the CS, Water balance analysis using the WEAP model ES mapping	Learning and relationships	Linked to the WP3 and WP5 and 6 activities. This part of the framework will serve for the testing of the strategy adopted by the stakeholders in Oum Zessar.
Visioning scenarios¹⁹	January 6, 2012 (IRA headquarter Medenine)	Preparatory meeting for the development of scenarios	IRA-CRDA-Actors	Identification of the scenarios and driving forces in Oum Zessar watershed Identification of the focal issue <i>“How to preserve and manage natural resources and agro-ecological system for a sustainable development in the Oum Zessar watershed within a climate change situation?”</i>	Scenario Building procedure adapted to Tunisia case study's document was provided to the WP6 leaders	Learning and partnership	Preparation of the Multi stakeholders working workshop organized on 13-17 February to further discuss and validate the scenarios building framework.

¹⁹ Scenarios building and vulnerability assessment

	13 -15 February 2012 (IRA headquarter Medenine)	Training and scenarios development Workshop	OSS-IRA-CRDA- Actors and WP6 leaders (PIK)	Identifying the key factors and driving forces that influence the global changes at OZW and their ranking Development of the "cognitive map" global changes key factors. Training of actors and local experts involved in the approach and starting the scenario identification process	Fleshing out of the preliminary scenarios for Oum Zessar watershed, Validation of the focal issue with the stakeholders. Elaboration of proposals with a wider range of stakeholders	Learning and partnership	Linked to the four scenarios described for Oum Zessar watershed and to INRM Plan
	July 17, 2012 (CRDA headquarter Medenine)	Consultation and follow-up workshop	IRA-CRDA-Actors	Re-scoring the driving forces of the scenarios in the basin (WP6)	Additional scoring was carried out at the 13-15 February 2012 workshops.	Social capital and partnership	This stage will be used to improve the four scenarios developed for Oum Zessar Case Study.
	April-June 2012	Scenarios Improvement and validation	OSS-IRA bodies WP6-WP7	Re-scoring options with Stakeholders, etc.	Relevant scoring of driving forces. Description of scenario 1 and 2.	Social capital and partnership	Linked to the WP6 workshop
	16 -17 February 2013 (Hotel Ksours Medenine)	scenarios Development workshop	OSS-IRA-CRDA-Actors and WP6 leaders	Finalizing the scenarios construction process Elaboration of two scenarios	Scenarios 3 and 4 described by two aspects: economic development and environmental preservation.	Social capital and partnership	Scenarios development process
Options assessment	11 July , 2012 (OSS, Tunis)	Internal meeting for synergy and AFROMAISON WADIS-MAR	OSS-IRA-NRD (WADISMAR)	Identification of the common activities of the two projects for a better management of resources and more efficient use of results, Possible synergies between the two projects.	Avoid the replication of activities and ensure the best management of resources	Partnership	Linked to water resources management in Oum Zessar watershed.

	April-May2012	Individual options discussions (Discussion, assessment, interviews, small meetings) Identification of actions	OSS-IRA Stakeholders	Discussion on the approach Options sheets elaboration Action plan for field visit	Availability of actors and partners	Social capital and partnership	Linked to options / actions identification and activities evaluation
	4 December, 2012 in CRDA headquarter	Consultation workshop	IRA-CRDA , different development sectors Actors	Progress of studies Selection of pilot sites of Soil and Water Conservation (SWC) techniques Screening of all technical SWC by areas of intervention Activities Planning for the three coming months	Identification of intervention areas Action plan for three months	Partnership and commitment of the different sectors actors	Linked to the SWC works' inventory
Option s, integration, plan design (plan building)	5, 6, and 7 September 2012 (Hotel Ksour Mednine)	Multi-stakeholders regional workshop on integrated natural resources management in Oum Zessar watershed	OSS, IRA-CRDA -Actors WPs 1,3,5 and 7 leaders	Progress of activities Reflections on the appropriate approaches to integrate options for an INRM in Oum Zessar watershed	Cooperation between the Tunisian team and the WPs leaders by exchanging information and expertise in terms of options and tools integration.	Social capital / learning by doing and partnership	Linked to options integration and strategy building
	Plan design by individuals or Small groups (Chronological maps (dynamics, trends) Integration maps)						
	September 2012	Group plan integration (1,2 or 3 plans) Space (maps, location, time frame, actors, etc;)	OSS- IRA – CRDA Champions /steering Committee, Stakeholders, WP3- WP4- WP5-WP7	Land Restoration and adaptation, water harvesting (WP3) How to apply Economic instruments and incentives (WP4) Spatial planning (WP5)	Elaboration of the consensual plan	Social capital / learning by doing and partnership	Linked to the strategies identification activity

	16- 25 January 2013	Consultation workshops with farmers at 3 pilot sites of Oum Zessar watershed	OSS-IRA-CRDA Actors farmers beneficiaries	Meeting on 16 January 2013 : Béni Khedache Pilot site (Chaabet El Anez) Meeting on 22-January 2013 : North Medenine Pilot site (El Oudeyette) Meeting on 25January 2013: Sidi Makhlouf Pilot site (Koutine)	Identification of areas and selection criteria Identification of beneficiaries Specifying the nature of the interventions Prioritization of farmers Development of action plans of budgeted interventions	Social capital / partnership	Linked to the INRM development plan for the watershed (Oum Zessar Watershed development plan)
Strateg y/plan testing	September 2012	Testing the "platform game"	OSS-IRA-CRDA Champions / steering committee, Stakeholders, WP7	Design & Organization of the testing intern sessions (play the management plan game)	Plan Simulation	Social capital / learning by doing and partnership	Relevant INRM plan and bankable strategic document for Oum Zessar Watershed
	Hotel Ksours 13-14 June 2013	Consultation workshop and meeting of the project's steering committee	OSS/IRA /CRDA Key actors and Stakeholders	Status of activities in the action plan that was developed with the project partners, Realization of step 2 : evaluation of economic instruments "Economic Instruments Design Matrix" proposed by WP4	Strategy Validation Action plan for the elaboration of Oum Zessar 's Integrated and Participatory Development plan	Social capital / learning / relationships	Relevant INRM and bankable strategic document for Oum Zessar Watershed

Implementation procedure	July – September 2013	Elaboration of Oum Zessar Watershed's Integrated and Participatory Development plan	OSS-IRA-CRDA Champions	Canvas development document elaboration	First draft of Oum Zessar Watershed's Integrated and Participatory Development plan was realized		Oum Zessar Watershed relevant Development plan to be presented to Tunisian authorities
	3 October 2013	Meeting of the Steering Committee	OSS-IRA-CRDA Champions Representatives of the Ministry of Environment and Agriculture	Presentation of the main results of the project and the document "Oum Zessar Watershed Integrated and Participatory Development Plan" was elaborated	Validation and recommendation for document improvement	Interest of the Tunisian representatives in the study case	Oum Zessar Watershed relevant Development plan to be present to collaborators
Perspective	3 – 4 February 2014	Multi-stakeholder national workshop for IPDP validation	OSS-IRA-CRDA Champions and Stakeholders. National and Governorate authorities, technical and financial partners, etc.	Presentation of the main results of the project and Oum Zessar's Watershed Integrated and Participatory Development Plan (IPDP) for validation			

V. Lessons learned

Strengths

- High involvement of local actors (stakeholders and communities) in the AFROMAISON implementation process.
 - Involvement of different NRM sectors in the process according to the project's proposal. OSS in partnership with IRA and CRDA made an effort to bring together representatives of the local technical services, Civil society (NGOs concerned with NRM) and local population (farmers, breeders...),
 - Creating a link between NRM science and the knowledge and needs of local communities.
- AFROMAISON led to the production of a knowledge platform by the multidisciplinary partners and WPs expertise. Its main aspects are the following:
 - Learning by applying several tools and methods proposed by the project such as: the rapid context analysis/diagnostic (Rapid assessment), economic instruments and ES assessment approaches etc...,
 - Water balance in Oum Zessar watershed by using the WAEP model. This work was carried out with the support of WPs 3 and 5 leaders.
- A paper entitled "Patterns and drivers of land use change in Oum Zessar watershed in the South of Tunisia: Consequence, impacts and management options for natural resource management" was submitted to the "Land Use Policy" (Elsevier Editorial System) journal, but was not accepted.
- A proposal to write a joint paper with South Africa case study was introduced (in progress) within the framework of exchanges with the WPs.

Weaknesses

- Lack or very little communication between CS and some WPs leaders which slowed the implementation at the case study level.
- Non-adaptability of WATAGAME tools to the Tunisian context.

Suggestions

Despite the flexibility of the AFROMAISON project, the component "participatory approach and integration options INRM" (WP7) should provide alternative tools and approaches other than the WATAGAME approach. For instance, it is the GIS approach which was used in Tunisia case study for actions and options integration.

VI. Approach Description / Basin Approach ("Approche Bassin")

The situation assessment and further survey results were used to identify specific options and proposals of INRM in Oum Zessar watershed. For this purpose, five (5) thematic working groups (TWGs) were created by researchers, CRDA technicians, and representatives of local and regional actors' services. These groups are specialized in various areas, namely : i) forests and rangelands, ii) water resources, iii) Water and Soil Conservation (SWC), iv) agricultural production (plant and animal) and v) the socio-economic aspects and economic instruments. A leader was assigned for each group to coordinate the TWG activities.

Taking into account the territorial level, three (3) more working groups composed of local stakeholders representing the civil society were sent to three delegations (Sidi Makhoulouf, Medenine North and Béni Khédache), covering the three geographical regions of OZW.

The involvement of these groups was crucial, especially to work with local stakeholders in each country to identify the most relevant and efficient actions and options for an INRM in their respective regions.

At this phase, multiple surveys and activities (meetings, workshops, field trips, etc...) were conducted to identify the best actions and options for an INRM in the watershed. These proposals were devised by territory (3 territorial working groups: TWG) and thematic (5 thematic working groups: TWG). This work was completed by study analyses within the framework of various programs and projects in the

region (state budget, regional development program, project NRM integrated development program (IDP), five-year development plan, etc. The actions evaluation process was described on “the action sheets” that have been adapted to the local context and suggestions from stakeholders. In fact, a simplified version of action sheets was designed and used for the description and technical evaluation of the financial, social and environmental actions proposed.

Options	Method of selection and specification	Specification Basis	Expert input in definition and selection	STH input in definition and selection	Debate generated by the selection or specification process
Strengthening the development, soil and water conservation, forest management works in OZW	participative workshops, The inventory and the assessment activities carried out by Thematic Working Groups (TWGs) and Territorial Working Groups (TWGs)	Water and Soil Conservation Forest Management and combat against erosion in OZW	Works Inventory and Characterization, cartography and cost estimation of the planned actions	Contribution to the selection of the areas to create new constructions for natural resources management.	Feasibility and alignment of pertinent actions and options. Combat against rangelands degradation and extend plantation, resolve land tenure problems. Valorisation and improvement of NRM Protection of Biodiversity Oasis watersheds protection
Develop rain-fed agriculture and promotion of agricultural productions (plants and animals)	Socio-economic survey and ...activities on the agricultural production aspects.	Enhance rain-fed and irrigated agriculture Breeding Development	Data collection and analysis	Identification of key actions for agricultural development of OZW.	Consolidation of the constructions by all kinds of plantation and introduction of other plants (pistachio, almond, fig, etc) Establishment of a nursery to supply the area with fruit trees (olive, almond tree, pistachio, etc) Improve breeding practices, in particular herding cattles (feeding, genetic, health) and valorization of breeding products and wastes.
Preserve, consolidate and support the achievements in terms of social infrastructure and facilities at OZW	Territorial Working Groups activities (workshop with local actors)	Road infrastructure and basic social facilities	Data Collection and Analysis and cost evaluation	Implication by proposals according to region	Proposed actions and investment cost in rain-fed and irrigated agriculture by assessed component. Improve the population's livelihoods. Contribute to a better integration of the watershed in its regional and national economic environment.
Development of a local economic fabric and income-generating activities promotion (local handicraft, tourism, services, etc.)	Territorial Group Activities (workshop with local actors) Data collection at the local level	Investment and income-generating activities Promotion and Institutional Development Research Development / study	Data Collection and Analysis Cost evaluation of the actions to be conducted for local economic development.		Encourage the social integration of unemployed people (creation of job opportunities) Diversify local economy through the creation of new economic activities. Valorisation and recycling of agricultural by-products Institutional Improvement and strengthening partnership between local actors and public structures, Contribute to a better implication of local population in the development process.
Application of economic instruments « subsidies for water and soil conservation»	Assessment according to the participative approach proposed by WP4	Encourage natural resources conservation in OZW	Tool application and report elaboration	Contribute to the selection of tools through the tools proposed by WP4	Identify subsidy water conservation tools at OZW and their impacts on the long term.

VII. Innovation in OZW Case Study

According to the obtained results:

- The AFROMAISON project brought together national (case study) and international experts (OSS), national researchers (IRA), institutions (CRDA), NGOs and different stakeholders involved in environment and NRM.
- Use of WEAP model for water allocations and assessment in Oum Zessar Watershed.
- Elaboration of scenarios taking into consideration the overall situation of post revolution Tunisia and water supply.
- Elaboration of “Oum Zessar Watershed’s Integrated and Participatory Development Plan (OZW-IPDP)” based on the AFROMAISON operational framework adapted to the Tunisian context.

This Plan is devised into three main parts:

- Section 1: Adopted approach for the elaboration of OZW-IPDP;
- Section 2: Biophysical and socio-economic diagnosis & implemented infrastructures and watershed management works in Oum Zessar;
- Section 3: Options and actions for SWC management & local development

VIII. OZW adapted Strategy Building

6. Strategy Development Approach

The strategy building is based on the integration of relevant actions and options identified by stakeholders for a better INRM. It aims to reassess and organize, through several workshops with key local actors, the most consistent and priority actions taking into account on the one hand the constraints, external aspects and synergies (negative and positive) and their technical, social, financial, and environmental aspects on the other.

In Tunisia case study, the stakeholders are committed to elaborate a development plan for Oum Zessar watershed. Hence, the proposed actions and options were prioritized and collected in a single document entitled «Oum Zessar Watershed Integrated Participatory Development Plan (OZW-IPDP)». The integration and alignment process was conducted according to a participatory approach involving the coordinated TWG, steering committee, local stakeholders and regional partners.

The main problems evoked at the strategy building are the following:

- i. Spatial dimensions (actions identified in the three geographical regions by the territorial groups);
- ii. Thematic dimensions (options identified by the TWG) and;
- iii. Their interactions as presented in the figure below.

Integration issues

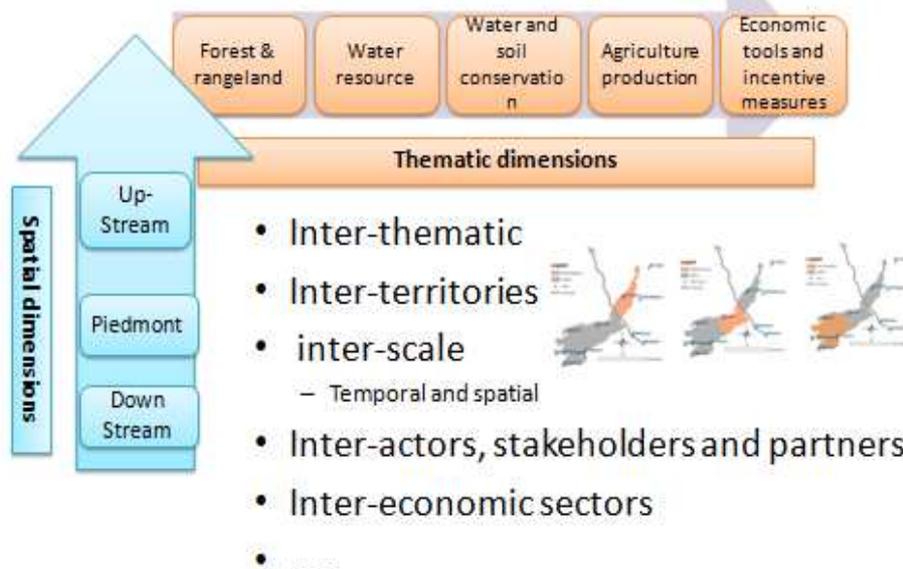


Figure 3: Presentation of Oum Zessar adopted approach of actions and options integrations

7. Main Stages for the OZW Strategy Development

The options, strategies and scenarios were identified and evaluated through tools considered as relevant to Oum Zessar context with the support of AFROMAISON partners. Thus, the choice of the approach was based on the following tools:

- Evaluation of scenarios in collaboration with WP6 using the scenarios evaluation method;
- Financial and economic evaluation using the EXTRA MOD mode with WP4I;
- Evaluation of ecosystem services in collaboration with WP3 and WP5 using GIS modeling (quantitative and qualitative assessment, mapping and vulnerability ESS);
- Evaluation of strategies to allocate water resources in collaboration with WP3 and WP6 using the scenarios assessment approach and the WEAP model;

It is important to note that WATAGAME method was tested in collaboration with WP7 but was not approved.

8. Other tools used

In Oum Zessar Tunisia case study, a number of well advanced spatial planning tools are used mainly at a local scale for water related issues, such as desertification. The main purpose of these tools is impacts assessment, indicators setting up, scenarios, participatory diagnosis and communication.

- **PPGIS:** This local-scale participatory tool is used for impact assessment and multi-criteria assessments of basins before and after any development. Its main outputs are thematic maps and conceptual framework.
- **GIS-based Agricultural Map:** This local-scale tool is used for season patterns analysis. The outputs consist mainly of different administrative boundaries maps and land use maps.
- **GIS-based Soil Water Assessment Tool (SWAT):** This local-scale adjusted SWAT (Soil and Water Assessment Tool) is used to simulate the main hydrologic processes in arid environments including water harvesting systems. Its main outputs consist mainly of maps, graphs, water balance, and impacts assessment.

- **GIS-based SIEL 2.0:** This local-scale tool is used for the characterization and evolution of a territory, in relation to environmental problems and economic and social development. It sets natural resources degradation indicators and develops scenarios. The outputs are mainly maps and setting indicators.
- **GIS-based Local Plan to Combat Desertification (LPCD):** This local-scale participatory tool is used in the planning process to combat desertification (LPCD) in rural development planning. The tool helps in participatory diagnosis and communication with stakeholders. Its main outputs consist of strategies, maps, a conceptual framework and impact assessments.

9. Combining different assessment approaches

Evaluation approach	Main characteristics	Main outcomes / results	Were the results presented to meso-scale actors and how?
Oum Zessar working team invited some of the WPs leaders to participate in the CS workshop (see table 1: chronological order of OZ case study implementation).	It aims to present and discuss with each WP leader (via email) the results and to benefit from their expertise in their respective field of competence.	Workshop Reports, Developed maps, etc.	Yes, by participation in the workshops
National monitoring and dialogue meetings between (or with??) Tunisia team steering committee and key stakeholders	In this case, it aims to present the TWGs or the territorial groups' preliminary results for discussion and recommendations. The short term action plans were elaborated	Meeting reports, Case study quarterly reports, Etc.	Yes, by participation in the workshops

10. Articulation between options assessment and other existing results

The biophysical and socio-economic diagnosis made in consultation with local stakeholders and regional partners aims first to highlight (through meetings) the major strengths and constraints of the three delegations of the watershed and second to analyze the general problem and guidance in the field of development, integrated natural resource management (INRM) at Oum Zessar watershed. Strategic orientations for IPDP-OZW were developed based on inquiries evoked by local and regional partners at the inception workshop in December 2011. The main question raised at the workshop was **«How to conserve and manage water resources and socio-agro-ecological systems for a sustainable development in Oum Zessar watershed area?»** Finally, the actions and options proposed by the local actors were recorded in synthesized actions sheets presented in the IPDP-OZW document.

Moreover, this process was implemented through two integrated and complementary approaches: (i) Thematic Approach and (ii) Spatial approach taking into account the socio-economic, agro-ecological zones (upstream, piedmont and downstream), and biophysical aspects.

IX- Description of OZW basin approach

In Oum Zessar Case study, the strategy adopted at the beginning by the stakeholders aims to build in a participatory way an INRM plan for the Watershed. The main problem that was taken into account in the approach development is water scarcity. Hence, the steering committee was committed since the launching of the project to follow up the TWGs activities and give guidance in accordance with the document of work (DoW) .

11. Commitments of actors and perspectives

Actors	Commitment	Specific approach	Specific Activities
Local technical services in NRM Farmers/groups/associations civil society, (NGOs) Researchers, Students National Experts	To participate in the case study process To support the team in some of their activities To elaborate the watershed development plan	Participation to the case study meetings Provision of data and information Participation to the field activities	assessment of NRM tools and elaboration of the watershed development plan based on water availability

12. Perspectives of the strategy implementation

- To submit the Integrated and Participatory Development Plan to the national and local authorities for approval. ;
- To identify the project's priority activities and submit them to partners for funding. ;
- Dissemination and replication of the lessons and approaches learnt in Plan development at the level of OZW. ;
- To carry on the development of certain evaluation tools, namely the WEAP model in order to strengthen the existent mechanism of management and water balance monitoring mechanism at OZW (establish a balance between water demand and supply) .

X- Suggestion concerning the WP7 activities

Comments

- Lack of diversification of the approach proposed by the WP in terms of participatory integration options.
- Lack of communication between project stakeholders (WP-WP and WP-CS).

Suggestions

- Introduction of other innovative approaches **taking into account** the overall situation of the country in concern.

10 Annexe 10: WP7 synthesis by case study team - uThukela

I. General information of the case study.

Location

The uThukela District Municipality (UTDM) is located in the uThukela watershed or catchment, also known as the Thukela Water Management Area (TWMA) in the province of KwaZulu-Natal (KZN). The UTDM is one of ten District Municipalities in the Province and is approximately 11 500 km². The UTDM consists of five local Municipalities namely, Indaka, Emnambithi/Ladysmith, Umtshezi, Okhahlamba, Imbabazane Local Municipalities. The uKhahlamba-Drakensberg Park which is a world heritage site occurs within the western boundaries of the Okhahlamba and Imbabazane Local Municipalities, which also forms the border between S.A and Lesotho.

The total uThukela watershed area is 29 036 km² and has its source in the Drakensberg mountain range in the west, on the 3050-meter high Mont-aux-Sources plateau adjoining Lesotho. The river cascades down a steep escarpment then cuts through the Thukela Gorge and, joined by many tributaries, which flows eastwards entering the low relief of the Thukela trough before cutting through a deeply incised valley, until it reaches the Indian Ocean about 85 km north of the city of Durban.

The Thukela watershed is a physiographically, climatologically, hydrologically and socio-economically diverse catchment. It is hydrologically complex with high spatial and temporal variability and unpredictable seasonal climate, and with streams contaminated by high sediment concentrations and acid mine drainage. The catchment is characterised by a juxtapositioning of “first world” commercial agriculture and industrial economies and “third world” impoverished communities dependent upon subsistence farming in degraded areas. Environmental problems arise from large-scale degradation through overgrazing as well as mining and heavy industry water quality issues. Substantial inter-basin transfers out of the Thukela system to the north (the Johannesburg / Pretoria complex) and the south (to the Durban/Pietermaritzburg complex) exacerbate these problems. Consequently, the hydrological characteristics of downstream natural flow regimes have been altered.

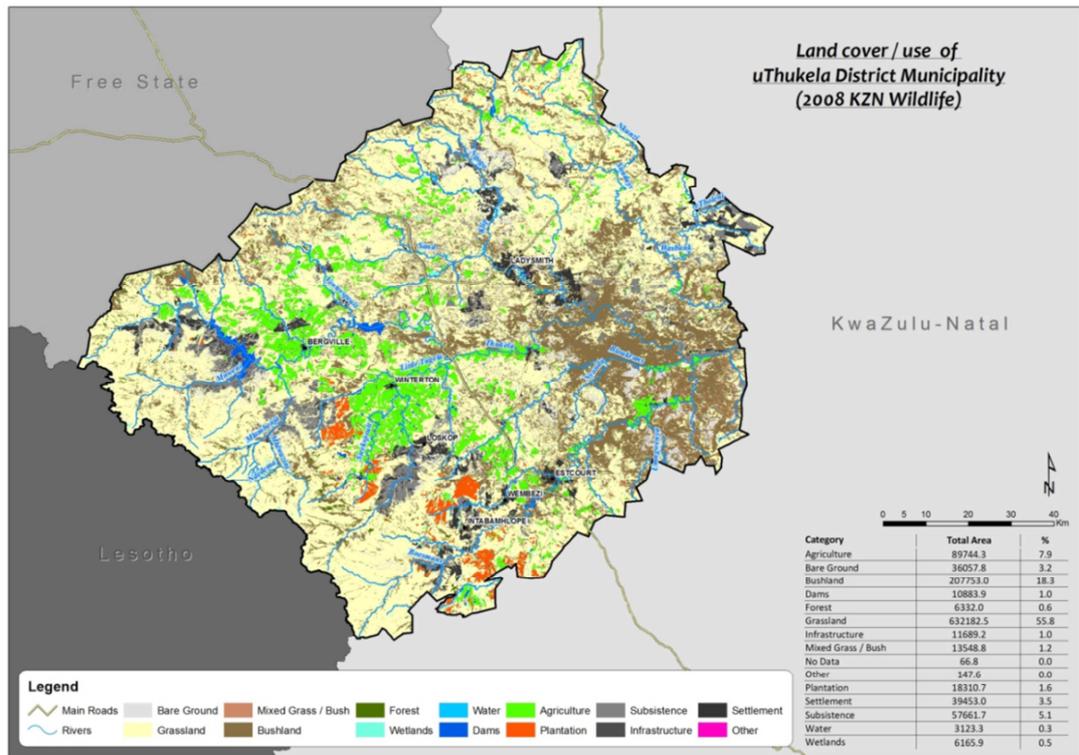
The Drakensberg Mountain Range

The Drakensberg Mountain Range is an extensive mass of basalt and sandstone that stretches from the Eastern Cape in the south through KwaZulu-Natal, the Free State, Mpumalanga and into the Limpopo province in the north. There exists an extreme range in altitude and diverse topography and geology. This has resulted in a rich diversity of habitats, fauna and flora, which includes local endemic and threatened species. The area also includes a rich cultural heritage left by the San. In addition to this internationally significant natural and cultural heritage, the KwaZulu-Natal Drakensberg is of significant economic importance to South Africa through the valuable ecosystem services that it produces. The most significant of these are water services which are becoming increasingly more important as the country's water resources become increasingly over-subscribed. The rich biodiversity and cultural value of the Drakensberg is the basis for its World Heritage Status. The Park is a major asset in terms of attracting both national and international tourists.

Upper Thukela sub-catchment

The Upper Thukela sub-catchment lies in the upper reaches of the Thukela River. The towns of Bergville, Ladysmith, Colenso and Weenen are located here. The Thukela and Klip Rivers are the main rivers in this catchment. This area is the source of water for the Thukela-Vaal Transfer Scheme, which, inter alia, transfers water to the Vaal River System. The transfer capacity of this scheme represents a large portion (about 30%) of the water resources available in the Upper Vaal WMA, which is the economic heart of South Africa.

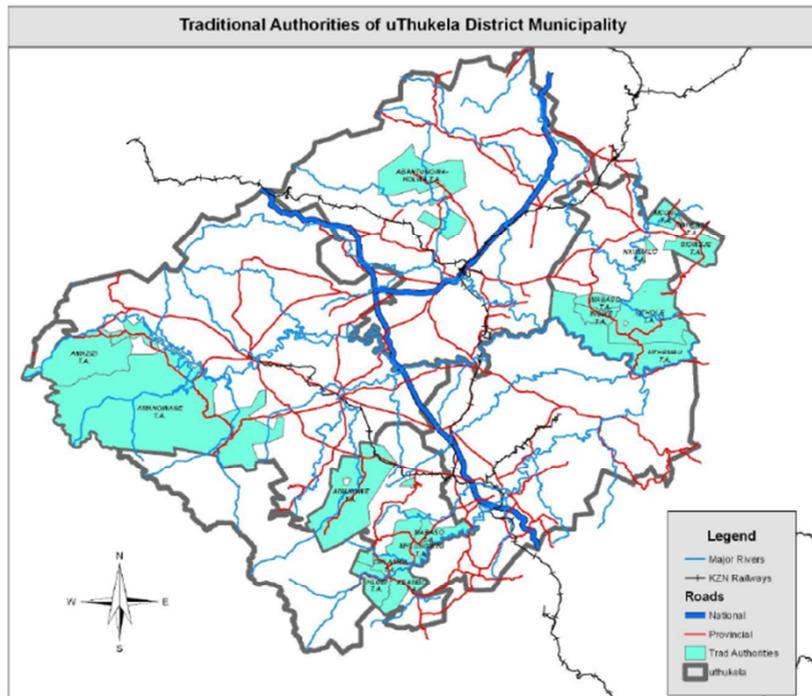
Over the last few years, the system has been operating below capacity due to the implementation of the Lesotho Highlands Water Project and the preferred utilisation of this gravity feed resource as opposed to the pumping of water through the Thukela-Vaal Transfer Scheme. The Scheme is now used by Eskom to generate hydro-electricity while large volumes of water remain available to augment Gauteng’s supply.



Land Cover / Land Use

The uThukela District Municipality is predominately rural (approximately 70%), with a dispersed rural settlement (DSPED 2010). Settlements (including urban and rural settlements) cover 3.5% of the land. Agriculture (cultivated land and stock farming) is the major land use in the uThukela District. Agriculture in terms of cultivated land makes up 13% of the land cover when combining commercial (7.9%) and subsistence agriculture (5.1 %). Stock farming, including beef and dairy cattle, sheep and game is primarily related to bushland and grassland areas which covers 74.1% of the land, although this value includes degraded grassland and bushland areas which would not be used for farming.

Large tracts of land are owned by a relatively small number of commercial farmers with average farm sizes of greater than 700 hectares and frequently with access to river water for supplementary irrigation. In the rural areas dryland subsistence agriculture and pastoralism are the dominant land uses since few of the rural communities have access to irrigation water (BEEH 2004). Subsistence farming and overgrazing in areas of poor and relatively unproductive land has resulted in large tracts of degraded land



Land Tenure

There are three main types of land ownership systems in the uThukela District Municipality.

The formally protected areas managed by the provincial conservation authority, Ezemvelo KZN Wildlife District Management. The World Heritage Site is approximately 87,400 ha or 8% of the total area of the district (DAE&RD 2011).

Commercial farms under “freehold” tenure. The farms are primarily owned and managed as commercial farming entities by individual farmers, trusts and companies, and presently cover an area of approximately 600,000 ha or 53% of the total land area of the district.

Communal land under communal land tenure. In terms of overall ownership, traditional lands and land reform areas account for approximately 40% of all land (in the UTM). Traditional lands are referred to as Traditional Authority while freehold settlements, land reform transferred projects and settled restitution areas (Figure 5) fall under different aspects of the Land Reform Programme of the Department of Rural Development and Land Affairs. Indaka and Imbabazane Local Municipalities have by far the largest share in traditional land, with areas as high as 83% being traditional land while the Emnambithi and Umtshezi Local Municipalities have the smallest percentage of traditional land.

From 1994 to 2007 a total of 55,523 hectares were transferred to 8,450 beneficiaries via the Land Reform Programme. The largest share of land was transferred in Umtshezi (50%), followed by Emnambithi (43%), accounting for approximately 93% of all land transferred. A single project (in Besters) accounted for the large portion of land (15,675 ha) transferred in Emnambithi during 2005. Only 1% of land has been transferred in Imbabazane and 6% in Umtshezi.

Municipality	Wards	2001 census	Percentage	2007 survey	Percentage
Emnambithi	25	225 459	34,3 of district	236 748	33% of district
Okhahlamba	13	137 525	20,9 of district	151 441	21% of district
Imbabazane	12	119 925	18,3 of district	140 745	20% of district
Indaka	10	113 644	17,3 of district	101 557	14% of district
Umtshezi	7	59 921	9,1 of district	83 906	12% of district
DMA		465	0,1 of district	515	
Total population of uThukela	67	656986	100	714 909	7.0% of province

Socio-Economic Characteristics

There were 714 909 people living in the UTM, which is 7.0% of the Province in 2007. Population density is about 63 people per km². The total population increased by 8,8% from 2001 to 2007. By far the largest population occurred in the Emnambithi/Ladysmith Local Municipality. The population distribution in the uThukela District Municipality.

Age and Gender

More than 60% of the population is between the ages of 5 to 34 year reflecting a high proportion of children and youth. It also shows a tapering off of adults, indicating two trends: out migration of economically active people, and the impact of HIV/AIDS-related deaths. The lower proportion of men to women (46:54) would support the former explanation, as men continue to leave the area and follow historical migrancy patterns. Life expectancy in the district is low, and explains the low population growth rate. Clearly this points towards factors that result in drastic increase in population mortality. The population structure of the district municipality poses a number of challenges. Firstly, the district has a young population that accounts for more than 60% of the total district municipality (010). Secondly, the economically active population accounts for only 36% of the district population. Thirdly, the prevalence estimates among the antenatal clinic attendees in 2009 recorded HIV/AIDS at 36.3%.

II.Meso-scale in your CS:

What is it?

The Meso-Scale is the District Municipality (DM) level of local government. Nationally there are 44 DMs and 7 Metropolitan Municipalities which have similar functions and size. There are 11 DMs and one Metropolitan Municipality (eThwini/Durban) in the province of KwaZulu-Natal. The Uthekela DM is the SA case study area. Within each DM there are between 3 and 6 Local Municipalities. Uthukela DM includes the following LMs: Okhahlamba, Imbabazane, Umtshezi, Indaka and Emnambithi-Ladysmith.



What are its functions in regards to INRM?

It is responsible for land-use and development planning, and for stimulating Sustainable Local Economic Development (LED). So municipalities need pristine areas to support ecotourism, a significant sector in this District and maintenance of productive land to support agricultural development and food security.

Local government is also mandated with the delivery of basic services including water and sanitation services. Municipalities have a direct demand from natural systems for the following key services – fresh water regulation and supply, waste water treatment and flow attenuation. In view of their mandates and responsibility, local government has both a direct and high level of influence on what land and natural resources are used for, a responsibility to do so in a sustainable manner, and high demand/interest in natural systems proving sustained ecosystem services to support their mandate of supplying basic services.

Why did you choose this territory? What where the determinant of your choice?

The District Municipality level was selected because:

- It is the level of government: at which national and provincial policy is converted into ‘on the ground action’ in terms of land-use planning.
- Planning at this scale informs planning and decision making at the LM scale.
- It is the scale at which government interacts directly with society and is more in touch with the needs of people.
- It is large enough to incorporate broad ecological systems and account for cumulative issues related to natural resources management. The provincial scale is too large and the LM or property scale is too small.

The Uthukela District was selected specifically because it includes:

- *High value natural resources:* including a World Heritage site, one of largest water catchments in the country, and extremely high value agricultural production areas.
- *Complex INRM Institutional Framework:* the area includes a full range of overlapping institutional structures governing land-use planning and management , including traditional, political and the implications of the World Heritage Site legislation. These are further complicated by the range of socio-political and tenure systems. This area therefore makes for a good case study for overcoming complex institutional and socio-political challenges to achieving integration.

III.The context of the implementation of the Operational Framework

Presentation of the “context” of the OF implementation, (connection with other projects, programs and interventions other than Afm)

An express aim within the case study was to integrate the strategy in an appropriate mechanism in order that the strategy is implemented. The Environmental Management Framework was selected as the appropriate mechanism in the case of the district municipality scale in South Africa at the DM scale for the following reasons:

- Main aims of EMF - Compilation of information and maps specifying the attributes of the environment in a particular geographical area to inform Environmental management.
- EMF has Legal standing – Regulations promulgated National Environmental Management ACT.
- Focus on Integration
 - Designed to promote co-operative environmental governance (integration).
 - Requires integrated stakeholder consultation in setting a Desired Future State (vision).
- Has a strong spatial focus and outputs.
- Outcomes – Strategic Environmental Management Plan (SEMP) detailing management plans and actions to address key environmental issues such as land degradation.

Importantly the EMF is a component of the Municipality’s Integrated Development Plan (IDP) which is the framework which governs all municipal planning and decision making. The outcomes of the EMF can also be used to inform a range of other District/Meso scale tools that influence land-use planning. These include the Spatial Development Framework (SDF), Land-use Management scheme (LUMS) and the various sector reports (Water Sector Plan, Local Economic Development Strategy).

How was the coordination done between the OF and other(s)s program(s) done ? What mechanisms were used: meetings (with whom, how many/how often); presentation of AfroMaison work (with whom), participation (what kind) of participants from other program(s) in AfM events; etc.

The AfroMaison Case Study Team engaged in two other programmes/forums as follows:

A) EMF

The CST approached the consultants undertaking the EMF regarding the possibility of integrating the AM strategy into the EMF.

The CST presented the background, relevance and benefits of integrating the AM outcomes into the EMF to the governmental steering committee. The Steercom agreed.

The CTS collaborated with the EMF team in the following ways:

- Supplied the baseline information gathered during WP2 to the EMF team. This included the stakeholder database, baseline spatial information, literature and information. This informed the EMF Status Quo Phase.
- The AM CST attended the EMF stakeholder meetings and the EMF team were invited to the AM stakeholder consultation.
- The outcomes of all AM consultation were provided to the EMF team to increase the amount of stakeholder inputs they could draw on. This included Visions from the initial workshop, all the technical workshops and the WAG game session reports.
- The AM strategy has been integrated into the EMF draft documents for comment.

B) Synergy Forum

- The CST started off participating in the synergy group which included various government agencies, programmes and several NGOs working in the area.
- This involvement assisted in getting a better understanding of the various initiatives, challenges. It also enabled linkages with local community workers who have been drawn on significantly in the consultation process when dealing with traditional communities.
- The CTS took over hosting the synergy meetings as the process developed.

IV Chronology of the different steps of the CS work (all WP activities not only WP7 study

Steps/ activity	Timing	Purpose, objective assigned	Actors involved	Main contents	Main outcomes substantive	Outcomes Social capital / learning / relationships	Articulation with other steps/ activity
Formal presentation to Planning and Development Committee of the DM	13 march 2011	Securing the buy in of the District Municipality to the project	Planning and Development Committee of the District municipality	Project presentation and proposal	It took a month or two following this to get their exco to agree and endorse the project.		
Workpackage 2 – preliminary stakeholder engagement	March – November 2011	Establish a preliminary understanding of the INRM context in terms of: spatial and other data documenting the biophysical, socio-economic and cultural status quo, governance framework, key stakeholders, the main INRM issues and drives of these.	Representatives from a cross section of key stakeholder groups and organisations including relevant national, provincial and local government departments. NGOs working the area were also engaged [Reference – summary of interviews at the end of the WP2 Report}	Introduce Afromaison project Collection and synthesis of desktop spatial data and information to document INRM status quo. Interviews with key stakeholders to supplement desktop information, establish issues and drivers, and assist in developing stakeholder list.	Stakeholder database [Attached as reference]. Spatial overview of natural systems, and socio-economic information. GIS baseline data which formed basis for Ecosystem services assessment and analysis. WP2 report Obtained buy in/endorsement of the project from the District Municipality and agreement to participate/ assist. [Reference – WP2 SA Case study report]	Established a relationship with and became member of the 'Synergy group" which included key INRM actors (govt, and NGOS) operating in the Drakensberg and buffer area. Established a good working relationship with half a dozen important actors, which was beneficial throughout the project, particularly the NGO: African Conservation Trust (ACT), whose field staff assisted throughout with engaging rural communities. Interview process provided opportunity for actors to unpack/synthesize their understanding of the context and main INRM issues.	Established a good baseline understanding and relationships with key actors that served the project team well throughout the remainder of the project.
ACT, a local NGO working in the area and.	First quarter 2011	Shared knowledge of activities			They alerted us to the existence of the 'Synergy Group' which we then became a member of; participation to the Synergy group	Interest in working and interacting with ACT the value of interacting with them.	

Steps/ activity	Timing	Purpose, objective assigned	Actors involved	Main contents	Main outcomes substantive	Outcomes Social capital / learning / relationships	Articulation with other steps/activity
Interaction with the synergy group	From month 4 to month 18	Shared knowledge of activities, networking	Synergy group participants including several organization and individual	Participating to synergy meetings until meetings ended		Securing participation of several organization and individual of the synergy meetings in activities of AfM	
Project presentation to DM	June 2012	to get formal agreement from DM to include the project in the EMF	<ul style="list-style-type: none"> • DM • EMF steering committee 	Project presentation Formal agreement elaboration	Formal agreement to include project outcomes (and process ?) into EMF		
1 st Integrated Stakeholder Workshop	17 July 2012 (1 day)	<ul style="list-style-type: none"> • Entrench/create awareness/understanding of Afromaison. • Update SHs on outcomes of baseline – i.e. INRM context and get feedback/verify. • Present ecosystem services approach and draft outcomes. • Present draft scenarios analysis. • Verify key INRM issues in Wshop process. • Based on above, establish broad Vision for Management Zones 	Comprehensive coverage of NRM actors [<i>Reference – workshop 1 attendance register</i>]. Entire case study team.	First part of the day involved the presentation of Afromaison background, the outcomes of the baseline review, the	<ul style="list-style-type: none"> • Increased stakeholder database. • Improved understanding of project and the INRM context. • List of NRM issues. • Broad NRM vision statements for management zones. <p>The effectiveness of all of the above were reduced because 1 day was inadequate to achieve any in more than a superficial level of detail/understanding – e.g. people provided generalized input such as “ the need for increased awareness and training – but not in relation to what and who needs it].</p> <p>[<i>Reference – summary of Workshop Proceedings</i>].</p>	The lack of support for or skepticism of the scenarios suggested that they should have been developed with SHs. From this point on the scenarios did not contribute any further to SH consultation process.	This workshop formed an important component of the WP7 monitoring and assessment of the stakeholder planning and consultation process (see next row).

Steps/ activity	Timing	Purpose, objective assigned	Actors involved	Main contents	Main outcomes substantive	Outcomes Social capital / learning / relationships	Articulation with other steps/activity
Monitoring of stakeholder planning and consultation process	April 2012 – October 2012	Assess the effectiveness of the consultation process in increasing SH awareness/capacity in terms of INRM, and the contribution to the project deliverables.	<ul style="list-style-type: none"> • M Pommerieux (Masters Student - Researcher). • Key stakeholders. 	<ul style="list-style-type: none"> • Interviews with key SHs prior to 1st SH workshop. • Analysis of Pre and post Workshop Questionnaires. • Post Wshop interviews with key stakeholders. • Integrated analysis consolidated in report [Ref²⁰]. 	<ul style="list-style-type: none"> • Analysis of levels of stakeholder understanding of NRM, context, issues and perceptions regarding change. 	<ul style="list-style-type: none"> • Valuable insights for study team in terms of understanding regarding the INRM concept, the need for integration and attitude towards change in their approach, habits, involvement with other role players. 	<ul style="list-style-type: none"> • Strengthened the understanding established in the WP2 baseline assessment. •
What A Game: Development and Application [Reference ²¹ for this step]	May 2012 – Nov 2013	<ul style="list-style-type: none"> • Establish an integrated understanding of INRM issues across role-players. • Test the INRM strategy or components thereof. 	<ul style="list-style-type: none"> • The game was developed with students from University of KZN and • The game was run with representative from a cross section of role players (6 games in total – see report). • The game was used to test the institutional structures considered appropriate to implement the INRM strategy. This involved a select group of stakeholders [see report]. 	<ul style="list-style-type: none"> • Development of game with study team, synergy group and students (Oct 2012 – Jan 2013). • Running the game in 6 sessions (Feb – July 2012). • Testing the institutional options for implementing the strategy (19 November 2013). • 	<ul style="list-style-type: none"> • More in depth understanding of the specific INRM issues and challenges and drivers of these. • Spatial focus of key issues in the Okhahlamba Local Municipality. • Guidance on the 	<ul style="list-style-type: none"> • Improved understanding amongst different role players of the issues faced by other stakeholders in times of resource scarcity and/or challenges faced by government in performing their mandate – due to playing roles other than their own. This shows the value of “putting oneself in another’s shoes”. 	<ul style="list-style-type: none"> • This contributed to the overall understanding of the integration required to achieve effective NRM, that was not evident in earlier engagement – see comments in report by M Pommerieux.

²⁰ Pommerieux, M, 2012. MONITORING AND EVALUATION OF A PARTICIPATIVE PLANNING PROCESS FOR THE INTEGRATED MANAGEMENT OF NATURAL RESOURCES IN THE DRAKENSBERG AREA – SOUTH AFRICA. A report submitted after a six-month internship in fulfillments for the degree of MASTER IN ENVIRONMENTAL SCIENCES AND POLICIES Of SCIENCES PO And UNIVERSITE PIERRE ET MARIE CURIE

²¹ S. Waldron. 2013. Afromaison Workpackage 7: Role Playing Game Final Summary Report. Institute of Natural Resources.

Steps/ activity	Timing	Purpose, objective assigned	Actors involved	Main contents	Main outcomes substantive	Outcomes Social capital / learning / relationships	Articulation with other steps/activity
Workpackage Technical Workshops <i>[References are WP 3 case SA study report²² and WP 4 report²³</i>	May 2013 – October 2013	Develop, refine and test the tools for these WPs.	<ul style="list-style-type: none"> Stakeholders with specific technical knowledge and experience in the District. Relevant WP members of study team. 	<ul style="list-style-type: none"> Series of workshops at which the draft tools developed by the study team were presented to SHs. Refinement of tools based on inputs from SHs and testing. 	<ul style="list-style-type: none"> WP 3 Tools: Document summarizing range of sustainable land management interventions for the District and guidance on selection for different socio-economic and biophysical contexts. WP 4 tools: Decision support tool (DST) and Design Matrix tool (DeMax) 	<ul style="list-style-type: none"> Improved understanding amongst SHs regarding the various management options and economic instruments. 	<ul style="list-style-type: none"> The development of these were an important part of refining appropriate management and economic instruments for the area and for increasing the accuracy of the strategy in terms of what needed to be done in each management zone.
Final/2 nd Integrated SH Workshop <i>[Ref: Proceedings of the Afromaison SH Workshop]</i>	18-19 October 2013	<ul style="list-style-type: none"> Obtain acceptance from SHs of the broad elements of the INRM strategy. Refine the strategy for each of the management zones. Define appropriate institutional structures and mechanisms to facilitate implementation of the strategy. 	<ul style="list-style-type: none"> Broad cross section of SHs. Case study team 	<ul style="list-style-type: none"> Day 1 <ul style="list-style-type: none"> Summarize the aims, objectives, approach and benefits of the Afromaison approach. Present progress and outcomes of each element. Obtain input on approach and broad outcomes Workshop specific strategies for defined management zones. Day 2 <ul style="list-style-type: none"> Finalise specific strategies for defined management zones. Review existing governance structures as basis for defining most appropriate structure for implementing the strategy. 	<ul style="list-style-type: none"> SH input and acceptance of the broad approach, tools and outcomes (with request for some changes). Detailed strategies for specific management zones. Insights into the strengths and benefits of different existing institutional structures - to inform development of optimal structures. 	<ul style="list-style-type: none"> SHs given some level of ownership of the strategy. Useful opportunity for SHs to collectively identify the factors required to achieve institutional co-ordination and to define the necessary structures. 	<ul style="list-style-type: none"> Essential in pulling together the efforts of all other steps and activities undertaken to this point.

²² McCosh, J, Dickens, J and Johnston, R. 2013. Sustainable Land Management Interventions for the Uthukela District Municipality. Report to Afromaison, a project funded under the Seventh Research Framework of the European Union. Institute of Natural Resources, Pietermaritzburg, South Africa.

²³ Lewis, F & Zunckel, K. 2013. Selecting and Designing Economic Instruments to Create Incentives For Improved Natural Resource Management A Case Study in the Upper uThukela District, South Africa. Prepared for Afromaison Project, Institute of Natural Resources NPC.

Lessons learnt by the organizers about the overall process ? What went right ? What went wrong ? Suggestion ? what important contribution you think very important to make

- A single day was inadequate for the 1st integrated stakeholder workshop. As a consequence, the main objectives of the workshop were not established at the depth of understanding hoped for, these being:
 - A list of successes/failures and factors for these
 - An integrated/agreed vision for the management areas identified.

Furthermore, Pre and post analysis of the workshop attendees indicated a discrepancy between what the study team hoped to achieve from the workshop (an integrated strategy), and what participants had hoped to achieve (mainly an increased understanding of the INRM concept). This suggests that more capacity building was required and/or that the aims and objectives could have been better advertised [Reference: ²⁴]

While the case study team contemplated re-running the workshop to 'finalise' these outcomes later in the process, it was decided that it was not warranted and would lead to stakeholder fatigue which had started to emerge as an issue in the last year of the project.

- The value of effective involvement by stakeholders. The value of the information gained from interactive engagement that required stakeholders to draw, write etc (even more so in break-away groups) activities compared with general plenary discussion was evident. WAG was a good example of this.
- Further to the above point, the value of spatial mapping in facilitating very focused discussion and making the issues relevant to the stakeholders (particularly landowners) was highlighted by the mapping undertaken following each WAG session [Reference - WAG game summary report by S Waldron].
- Effective stakeholder involvement is an essential aspect of such a research project, especially if there is a concerted effort to make the outcomes relevant and meaningful to the role-players at the scale of involvement. Stakeholder availability and fatigue are however unavoidable issues in a long term project such as this. Particularly in the case of certain key stakeholders who were considered important for participation at most of the events due to both their technical input and overall experience/background. Very few, if any stakeholders can afford to attend anything more than a day or two at the most for a single event or workshop. Even for two day events, a large proportion of people only attended one of the two days. The implications are that:
 - Stakeholder fatigue is inevitable at an individual or organizational level and continuity is lost along the way. This does detract from the overall inputs and buy in to the outcomes.
 - Effective integration requires representation from all key role-players - particularly into the final outputs. This i.e. negatively affected where fatigue or non/availability results in key sectors/role-players not being available. The notable example in the Uthukela case study was the commercial agriculture who initially participated in several events but did not make themselves available in the last few major events.

Options for addressing this include keeping the engagement fresh by avoiding repetition, using different techniques for involving stakeholders and only involving stakeholders when really necessary. A key lesson was that "effective representation is more important than ensuring large numbers of ineffective participants".

²⁴ Pommerieux, M, 2012. MONITORING AND EVALUATION OF A PARTICIPATIVE PLANNING PROCESS FOR THE INTEGRATED MANAGEMENT OF NATURAL RESOURCES IN THE DRakensberg AREA – SOUTH AFRICA. A report submitted after a six-month internship in fulfillment for the degree of MASTER IN ENVIRONMENTAL SCIENCES AND POLICIES Of SCIENCES PO And UNIVERSITE PIERRE ET MARIE CURIE

V Description of the approach (es) to select options

The approaches and tools used to build the strategies and integrate the options into a plan. What approach was used ? Brief description of tools used if necessary who participated in the use of the tools and if group work was organized how was it structured was there any integration or merging afterward and how was it done

Types of options	Method of selection used and specification used	Basis of specification (especially if was adapted in your CS)	Expert input in and definition selection	STH input in definition and selection	What debate the selection or specification did generate which you think important to mention ?
WP 3 Sustainable management actions	<ul style="list-style-type: none"> Stakeholder workshop to identify most appropriate/necessary management actions (and combinations of actions) to address priority issues in different management areas. 	?? - Not sure what is required here	WP 3 - Experts guided the development of the suite of management options included within the list of options.	WP 3 - Technical specialist among SHs assisted in prioritization of options.	The concerns regarding implementation that are listed under question 11.
WP4 Economic instruments was refined through	<ul style="list-style-type: none"> Application and testing of the Decision Support Tool (DST) - designed to select most appropriate instrument based on socio-econ, tenure etc criteria AND DeMax tool - compiled to highlight challenges to implementation of instruments and designed accordingly. Selection of existing institutional structures were analyzed in workshop structure with full range of SHs to understand benefits and short comings of various options and what criteria need to be met for optimal structure. 		WP 4 - Technical experts within the team and sub consultant were involved in the design.	Technical experts within the SH were involved through a series of Workshops in developing and testing the tools used in prioritizing the economic instruments selected to support implementing the management actions.	
WP 7 Institutional structures	The options were then tested against reality by running the WAG RPG for the different structures.		The team members have a very good understanding of the institutional framework and managed discussions regarding the various options.	The SHs involved in analyzing the options can be considered experts in that they are members of the framework and understand better than anyone the strengths and failings of the framework and specific elements.	

Types of options	Method of selection used and specification used	Basis of specification (especially if was adapted in your CS)	Expert input in definition and selection	STH input in definition and selection	What debate the selection or specification did generate which you think important to mention ?
DEVELOPING THE STRATEGY					
<p>The available options were the:</p> <ul style="list-style-type: none"> - Mix of prioritized management and financial instruments for each - Range of stakeholders (including groups and specific such as individual NGOs working in the area and specific govt departments) - Timing options (short, medium and long term) 	<ul style="list-style-type: none"> ▪ The work shopping method applied in selecting different management actions, fin instruments and actors over time is documented in the proceedings of the workshop <p><i>[Reference²⁵]</i></p>	?	<p>The process involved groups developing the strategy for each management zones - involving relevant experts.</p>	<p>Stakeholders selected which group/area they were interested in developing the strategy for i.e. where they had a specific interest and knowledge.</p>	<p>The debate was continuous and numerous issues were raised, which is part of arriving at consensus on the mix of options.</p> <p>As this is s strategy, several high level challenges remain and these relate to implementation as discussed under section 11 of this document.</p>

²⁵ DEVELOPMENT OF AN INTEGRATED NATURAL RESOURCES MANAGEMENT STRATEGY FOR THE UTHUKELA DISTRICT STAKEHOLDER WORKSHOP: Summary of Proceedings of a Workshop held at Blue Haze Lodge, Estcourt, South Africa, 18 & 19 September 2013

Innovation : did the process help emergence of innovation (for example innovative option compared to options already tested and promoted or the way options were being used, or the way people link them to other dimensions, or what they did consider in the option)

While probably not innovative, the process highlighted the need to implement a range of options (as opposed to current focus on single or quite limited range of interventions) within focus areas to make a real change.

Also, not necessarily innovative, but important was how the process led to alignment of the issues with the selection of appropriate management tools and financial instruments so there is a strong link between the cause, issue, response and that it is relevant to the specific socio-economic and land tenure context within the management zones.

The testing of the institutional framework using WAG was quite innovative because it was the one element of the strategy where the confidence in the selection of options was lowest. By using WAG it was possible to test the options 'in real life scenarios'.

VI "Building / crafting of the strategies" (strategy = a set of options of different categories)

Has the building of the strategy lead to any discussion or debate or differences between type of actors important to mention (difference/similarity/connection etc)?

It has raised an important debate in South Africa in relation to the institutional structures and focus of resource management. Legislation, governmental structure and management actions is currently focused around specific resources i.e. water, forests, agricultural resources. And while there is legislation that demands integrated planning and action, it is not happening because government is operating to achieve its core mandate dictated by specific legislation i.e. the integration is not considered core to meeting their mandate. A good example is water. The institutional structures designed to manage water are catchment management agencies (CMAs). They are supposed to apply IWRM in achieving integration and involving all role players. But this has a water focus so integration is not achieved. The scale at which CMAs operate is also being challenged. The Afromaison model is being written up as a new approach to NRM, in terms of scale and moving away from specific resources (water, agriculture) focus to a more holistic governance approach. The Waer Research Commission has funded the write up which is entitled "*From IWRM to INRM*". The timing is appropriate because the WRC has funded a much larger long term project that is designed to explore completely new approaches to resource management.

What were the main issues faced when building the strategies? (process)

- Stakeholder fatigue (see number 11).
- Stakeholder capacity to understand technical aspects and participate meaningfully. In retrospect more time is needed building capacity instead of just involving stakeholders at workshops where development of outcomes is required.
- Obtaining involvement from role-players when it could not be justified in terms of their job description/mandate/core focus.
- Maintaining consistency and interest over a long term. IN retrospect it would have been useful to have had a communication plan to ensure ongoing involvement/interaction with stakeholders.
- Social and political issues are some of the most significant factors affecting integration and most difficult to overcome as they are entrenched in sometimes hundreds of years of tradition.
- While the District level is considered appropriate as the 'Meso-Scale' it is spatially difficult to cover comprehensively in terms of consultation during a research project. Consequently there was a focus on the Western areas of the district where the integration was most challenging.

VII Combining different assessment approaches of the strategies

Evaluation approach used (from different the WPs)	Main characteristic of the approach as used in the CS	Main outcomes / results	Was the outcomes results presented to meso scale actors and how ?
To evaluate the strategy			

The prioritization of the different options and the final selection of these is discussed at various points above. The only element of the strategy that was tested were the different institutional arrangements – also discussed at various points. Nothing to add.

Were they any attempts to articulate/coordinate the results of the assessment with other methods or provide a synthesis ? if so how ?

VIII Narrative for the strategy

The application of management action and economic incentives appropriate to the socio-economic and biophysical context within areas of the Uthukela District delivering priority ecosystem services, and within a governance framework that promotes integrated action in the long term.

Importance elements:

- i. Long term/sustainability –one of the key issues presently is the short term focus.
- ii. Priority areas – based on ecosystems services because the ES approach makes the link (integration) between natural resources and socio-economic systems. It also supports integration across natural systems thereby overcoming the silo approach to management that arises from the legal framework and historical legacy.
- iii. Governance framework that promotes integration – currently there is lack of incentives to promote co-ordination and the bureaucracy and structure of the legal framework creates inertia and frustrates co-ordination.

Commitments of actors and perspectives

IX What are the perspectives the follow up and implementation of the strategy?

Stakeholders expressed a concern at the end of the workshop, that the strategy will not be implemented due to the following issues:

- The lack of capacity within the role-players responsible for implementation, as they are oversubscribed in terms of just delivering on their core mandate without having to deal with an additional requirement. This is a misguided perception because the strategy is actually designed to support these stakeholders achieving their mandate in a more efficient way.
- It is relatively high level and requires the involvement of people involved in day to day management i.e. the strategy needs to be filtered down if it is to work – this relates to the need expressed in establishing an effective institutional structure and associated communication mechanisms that will allow for involvement and flow of information between stakeholders, and for them all to meet on a regular basis at an appropriate frequency in order to monitor progress.
- Who will take responsibility for implementation and coordinating involvement? This concern was raised because the institutional arrangements were workshoped at the final workshop and post workshop testing via WAG – rather than a range of structures being presented at the Workshop and agreed to – this would have instilled greater confidence.

In response to the above concerns the strategy has been amended to indicate:

- The institutional and communication structures that needed to promote and sustain coordinated action and planning.
- Recommendations around responsibilities for coordinating implementation.
- Steps to take the strategy from a district scale, to defined planning and operation at focus sites across the municipality.
- A presentation of the final strategy to the key role-players that will include workshoping of actions, projects and responsibilities required to take the strategy to implementation.

X Suggestion concerning WP7 activities and work

Do you have any other suggestion or comment regarding AfroMaison WP7 activities and work? No

11 Annexe 11: WP7 synthesis by case study team - IND

I. General information of the case study (rapid description, what are the stakes, why does it matter?).

The Inner Niger Delta provides an array of ecosystem services amongst which the provision of natural resources providing food to the people. These form the basis of a rural economy in the delta serving about 1.5 million people and also contribute significantly to Mali's national economy. The Inner Niger Delta Food production concerns fisheries, cattle breeding and rice growing, next to bourgou (fodder for cattle) and economically small activities like bird exploitation. The exploitation of these natural resources is linked to various ethnic users groups although the historical and traditionally strict separation is less distinct today. Population growth in the Delta is high. Population pressure on the use of the natural products is reaching the level of overexploitation in some areas and during certain periods. The carrying capacity of the IND to provide ecosystem services and natural resources is closely related to its dynamic flooding regime. During the wet season large parts of the Delta become inundated. During flood recession, the bourgou fields emerge providing huge amounts of fodder for the livestock. Farmers grow their traditional rice in this time. Finally, large parts of the IND become dry and arid again at the end of the dry season. As the flood regime of the Upper Niger is significantly altered by the development and operation of a number of upstream dams used for hydropower generation and water diversions for large-scale irrigated agriculture. Climate change may further cause alterations in this flooding regime.

II.Meso-scale in your CS:

What is it?

In the Mali case study, the meso-scale is taken to be the so-called "cercle" administrative scale. A cercle is a group of municipalities and communities and consists of an average of 250,000 people. In the Mali-case study 3 different cercles were selected as they all represent different biophysical and socio-economic situations in the delta:

- Cercle Ténenkou, commune Diafarabé, an important herd crossing point in the delta
- Cercle Mopti
- Cercle Youvarou, commune of Deboye (near Akka, Lake Region, fisheries).

What are its functions in regards to INRM?

The natural resources in the delta are used by (individual) farmers, fishermen and herders, often still in a communal setting on mostly communal grounds. Owner rights and users' rights (partly flood-dependent) are crucial to the land use patterns. Ambiguity in the distribution of these rights, sometimes lead to land tenure conflicts. In order to manage the scarce natural resources and the different stakes and, traditional institutions have been developed at the scale of what is now called a cercle. These traditional institutions are e.g. dioro's for cattle grazing, maître d'eau for water rights. Increasingly livelihood development groups have been mobilizing themselves and have organized them in all kinds of user associations like: fishermen co-operations, comités locales rurales d'orientation stratégiques d'aménagement territoires and more recently water user associations (under the NBA). It is at this scale where the bottom-up, community- or cercle based approach to natural resources management meets the top-down government driven approaches. Regional Governmental organisation like the Opération Riz Mopti, Direction Régionale de la Pêche Mopti, Direction Régionale Agriculture et Elevage, Direction Regionale de l'Hydraulique operating in the IND, cooperate with the bottom-up organisations.

It is assumed that it is especially this scale where both type of NRM-organisations meet and work together is the most effective scale to manage local and more immediate livelihood needs (strongly depending local natural resources availability) while incorporating spatial ecosystem relations and issues that take place on larger spatial and temporal scales. We assume that this scale is the most effective scale for implementing

interventions that lead to an improved and more integrated natural resources management in the Inner Niger Delta.

Why did you choose this territory? What were the determinant of your choice?

Three different cercles were chosen for the Mali case study. Each cercle represents a distinct biophysical area within the IND which has resulted in different livelihoods developments fitting the local context best:

- 1) The region of Diafarabé is important in the context of OPIDIN as Diafarabé is the main crossing point of cattle herds that enter the delta. The crossing dates are fixed by a committee of Diaro's and the Governor of Mopti, and depend on the flood performance. Important users groups in the Diafarabé region are pastoralists.
- 2) Mopti is traditionally a commercial centre and crucial in the socio-economic context (trade, fish landing, stocking and transshipment, etc.). Mopti lies just east of the confluence of the Bani and the Niger proper. In terms of land use, the region of Mopti is very important to farmers. On the east bank of the Niger the Operation Riz Mopti is found, a large area with inundated rice cultures, highly supporting to the total rice production in the Inner Niger Delta.
- 3) The lakes are extremely important to the fishermen in the delta, and these resources are exploited heavily. Also the lakes are the core area for bourgou fields, which are used as fodder for the cattle. At the same time the bourgou fields are crucial as spawning zone for fish fry and harbour a high density of migratory birds. In terms of biodiversity the central lakes are of global importance as during the dry season hundreds of thousands of birds are gathering here, and prepare for the migratory journey to their breeding grounds.
- 4)

III. The context of the implementation of the Operational Framework

Presentation of the "context" of the OF implementation, that is the connection with other projects, programs and interventions other than Afromaison

Various other projects/programs are taking place in the IND which connect to integrated natural resources management. These projects are:

- *EU FP7 project Dewfara* on developing frameworks and implementing tools for the provision of early warning and response to mitigate the impact of droughts in Africa
- *EU FP7 project Impact2C*: estimating the effects of a 2 degrees temperature increase on the biophysical system of the IND and upper Niger, its impacts on various important economic sectors and livelihoods, the vulnerability of those sectors to the foreseen changes and the adaptive capacity needed and available to deal with these changes.
- *Dutch MFSII-funded Partners for Resilience*: In Mali, the PfR alliance is working with communities in the regions of Tombouctou and Mopti, where project communities are introduced to simple techniques to strengthen and diversify livelihoods and adapt to climate change while using and restoring their surrounding ecosystems: drought-resistant seeds, rehabilitation of wells, and the cultivation of vegetable gardens. Micro-credit mechanisms such as "bio-rights" and savings groups have been set up. Partners have also developed hybrid solutions in which the building of dykes is combined with tree planting. They discuss with the authorities the downstream impact of water infrastructure upstream in the Niger delta, aiming at equitable and sustainable solutions.
- *Dutch MFSII-funded Wash alliance*: The WASH project has an ecosystem-based approach. How to improve the effectiveness of WASH interventions by using the working of surrounding ecosystems and landscape and how to reduce impacts of WASH interventions on the integrity of these systems.
- *OPIDIN implementation project* with the Dutch Embassy, Direction Regionale de l'Hydraulique and other: embedding the flood forecasting tool in Mali operational management structures and improving the timely dissemination of flood forecast information to the various groups of stakeholders in the IND, using appropriate communication means.

Not all listed projects have the same geographical focus.

How was the coordination done between the OF and other(s) s program(s) done? What mechanisms were used: meetings (with whom, how many/how often); presentation of Afromaison work (with whom), participation (what kind) of participants from other program(s) in AfM events; etc.

- The Afromaison project has been promoted at various events to the other alliances and networks related to the connecting projects
- The Afromaison project has strongest relationship with Dewfora. Some of the workshops organized in Mali had a dual purpose serving the Dewfora and Afromaison projects simultaneously. Stakeholders present in one project were sometimes asked to join the workshops of the other meetings. PIK and WI are involved in both projects (and also Imapct2C) and on the “European level” coordination has been taken place.
- The drought forecasting tool OPIDIN development and implementation has been part of AFROMASION and Dewfora.

IV Chronic of the different steps of the CS work (all WP activities not only WP7 study

Steps/activity	Timing	Purpose, objective assigned	Actors involved	Main contents of the steps	Main outcomes substantive	Outcomes Social capital / learning / relationships	Articulation with other steps/activity
Segou Workshop	26-29 June 2012	<ul style="list-style-type: none"> -Present AFROMAISON project; - Discuss the relevant scenarios for DIN; - Discuss and decide to retain study sites in IND; -Present and discuss the plan and track work designed to AFROMAISON; -Take into account the ideas and suggestions from stakeholders for the implementation the project - Amend tools and questionnaires proposed for data collection in IND. -Presentation of economic instruments -Group work on first identification of economics instruments for IND 	<p>Representatives of:</p> <p>ABFN / Mopti, DRP / Mopti, GDRN5 / Mopti, ARM / Mopti, Agriculteur / Akka, Eleveur / Akka, Pêcheur / Akka, Agriculteur / Kakagna, Eleveur / Kakagna, DRA / Mopti, FODESA / Mopti, Sahel Consult / Mopti, PDD-DIN, Foundation 2iE, Commune de Ouroubé Doudé, CARE / Mopti, DREF / Mopti, Mayor of Dialloubé, DRH / Mopti, Mayor de Diafarabé, DRPS IAP / Mopti, DRPIA / Mopti, Office Riz Mopti, Office du Niger, SFN/ABN, DNEF/Mopti, CNU – Bamako</p> <p>Facilitated by WI and 2iE</p>		<p>The workshop was a good opportunity to inform stakeholders on the contours of AFROMAISON project and to obtain their views on lines of thought and activities. It helped to improve and update the content of some WPs. The workshop was also an opportunity to identify structures that are important in the process of capitalization of information on the DIN. Furthermore, validation of meso-scale sites by participants was done</p> <p>Validation of scenarios for IND case study was carried out</p> <p>Identification of stakeholders champions</p>	<p>Network with stakeholders built</p> <p>Adoption and appreciation of AFROMAISON project</p> <p>Learning from stakeholders on local context reality</p>	<p>Feeds into next steps</p> <p>Implication of different regional institutions in information collection for WAT A GAME tool and background preparations</p>
Surveying of perception of flood dynamics and potential INRM options at grass root level	Non-Dec 2012	<p>This survey was carried out to assess the perception of the flood dynamics within 3 livelihood groups (fishermen, rice-cultivators and pastoralists), assesses the need for forecasting information and inventory potential INRM options</p>	<p>2iE who survey and analysed the data</p> <p>About 66 fishermen, farmers and pastoralists coming from the various case study villages</p>	<p>Survey Analysis Use if info in next steps</p>	<p>The State or non-governmental organizations are not involved enough, they should strengthen its action plans to help the people of DIN to properly organize its activities and increase the access to information of flood forecasts</p> <p>As a means of adaptation, people should, in addition to the existing measures, invest in scaling up activities that can help to cover needs during every season such as: fish farming, gardening, regeneration bourgou, etc.</p> <p>See report on Emdesk</p>	<p>Relationship with stakeholders at village level built</p>	

Steps /activity	Timing	Purpose, objective assigned	Actors involved	Main contents of the steps	Main outcomes substantive	Outcomes Social capital / learning / relationships	Articulation with other steps/activity
ES mapping workshop	January 2013	Validation of expert judgment's scoring of Ecosystems Services The theory of Change method was used	This was done with support from local reference people and external resource persons from regional Institutions.	Wetlands International's Morri Diallo was the expert who scored the Ecosystem services for the IND. A workshop was organized where these scores were shared and checked in a panel of stakeholders For one land use types the scores were revised in a group process	For one land use types the scores were revised in a group process See report on Emdesk	Stakeholders were trained in the concept of ecosystems services and ESS mapping and valuation	The quality and the reliability of the ESS scores remains relative subjective. It was decided to leave it standalone and not use the results of this exercise to much in other activities.
Scenario-development and impact assessment	throughout	With livelihood options and natural resources in the IND being highly dependent on the IND's flood dynamics, 7 scenarios were developed and modelled with SWIM model by PIK. Each scenario represents a possible future situation of flood dynamics as a result of changing climate and changed upstream water allocation. The impacts assessment was used to test the robustness of the 3 proposed meso-scale INRM-strategies	The scenarios were mainly developed by the WI, A&W and PIK but in consultation with selected stakeholders	Development of scenarios Modelling of scenarios with SWIM model Assessing the impacts of the scenarios on temperature, flood levels, water availability, timing of flooding, inundation area, potential to grow rice and fish Testing the meso-scale INRM-strategies by confronting them with the modelled scenario impacts			

Steps /activity	Timing	Purpose, objective assigned	Actors involved	Main contents of the steps	Main outcomes substantive	Outcomes Social capital / learning / relationships	Articulation with other steps/activity
Strategy Development workshop Mopti	May 2013	Develop 3 strategies for INRM for the IND	Representatives of : CNU - Mali , FODESA / Mopti , Mayor DIAFARABE , Office du Niger , WAGUE SFN / ABN , PDD - DIN / , DAACFH / DNEF , GDRN5 , ORM , Conseil Régional , CRA / Mopti , Eaux et Forêts Youwarou, DRPSIAP/, DRH / Mopti	Explanation of concepts like INRM, strategies Explanation of approach followed during workshop Information about climate change scenarios and dam operations Feedback form grassroots survey and Segou workshop into this workshop Workshop (group sessions and plenary discussions)	3 strategies drafted 1)To insure the control of water (water security)in IND and to make a success of the arrangement of agro sylvo-pastoral and biodiversity preservation ; 2) To Adopt options of response of mitigation and adaptation to climate change in IND ; 3) To strengthen the technical and organizational capacities of the actors See report on Emdesk	Network nurtured Views between different sectors and between different scales shared	These strategies are considered as draft and are improved by incorporating Economic instruments and tested with the Wat-A-Game
Ouaga dougou meeting	Mars 2013	Inner Niger delta case study game improvement	IRSTEA Staff, WI Staff, ZIE Staff	Game frame and specific zones Actors definition Process of one game session with events namely before and after a flood	Game finalisation Role cards Activity cards Monitoring table Game rule		

Steps /activity	Timing	Purpose, objective assigned	Actors involved	Main contents of the steps	Main outcomes substantive	Outcomes Social capital / learning / relationships	Articulation with other steps/activity
EI and Wat-A-Game workshop	8-12juillet 2013	-Identification of economic instruments for the delta -Improved strategies with the addition of non-technical options -test with Wat-A-Game	Representatives of : Mayor de Diarafabe, Mayor de Dialloubé, Mayor de Deboye, Service de la production et industrie animale, Direction Régionale de la pêche, Office du riz de Mopti, Réseau pour la gestion des RN de la 5ème Région, Direction régionale du PDD-DIN, Femme ressource en gestion des RN (Youvarou), Direction régionale plan, statistique et informatique Facilitated by WI, IRSTE A and 2IE	Presentation of Economic instruments and the different tool (DST and Dmax) to identify instruments for IND Discussion on strategies develop in Mopti to identify behaviours requiring economic initiatives and additional (mainly non-technical) options for the strategies Use of DST in plenary session to make a first choice on instruments Use of Dmax in plenary to score each instrument selected with DST Selection of options for the improved strategies (vote on options from Mopti and discussions) Presentation and test of the Wat-A-Game board game Insertion of some elements of the strategy in the game	Economic instruments to push : Sustainable management of the pastoral areas (Voluntary Environmental Agreements, User Charges, Use Rights);Reduce deforestation (Voluntary Environmental Agreements, User Charges, Environmental Subsidies) ; Sustainable fishing (Voluntary Environmental Agreements, Performance Bonds, User Charges) Additional non-technical options and propositions for merging the strategies Improved version of the Wat-A-Game	Participants despite their belonging to specific sector which they want to make it as priority realized the link between the different biophysical elements as functional unity. Accordingly became realistic when scoring the tools. The game was able to display how actors may face environmental degradation using a complex system of negotiation and formal and informal agreements.	The strategies previously developed were enriched and very partially tested with participatory simulation WAT A GAME.. The EI are to be integrated to these strategies.
Toro workshop	July-august 2013	Progress of case studies based on recommendations of Tunisia workshop, Pilot experience of Uganda case study	<ul style="list-style-type: none"> • Representatives of each AFROMAISON case study, • IRSTE A Team; • Uganda case study stakeholders 	<ul style="list-style-type: none"> • Interaction with critical friends, • Identification of main suggestion from this interaction • Identification of the main modification • Identification of the main difficulties • game representation • The calibration • Link and interaction with Afromaision 	<ul style="list-style-type: none"> • First draft of the game development process including; • Issues and state of the case study • The game spatial structure • Resources, role and activities • Game regulation • Monitoring • Debriefing • Game session planning 		

Steps/activity	Timing	Purpose, objective assigned	Actors involved	Main contents of the steps	Main outcomes substantive	Outcomes Social capital / learning / relationships	Articulation with other steps/activity
Integration workshop	November 2013	The purpose of this workshop was to improve the strategies earlier developed in MOPTI workshop with an enriched directory of actions from Ouagadougou workshop and spatial planning tool called OPIDIN.	Experts from : <ul style="list-style-type: none"> • FODESA • DRP • PDD - DIN / • GDRN5 • ORM • Women Group Associations leader • Eaux et Forêts • DRPSIAP/ 	Review of MOPTI and Ouagadougou workshop Make linking between additional actions and previous ones in strategies Analyse the role, resources and responsibilities of each actions in the different thematic sector Integration of EI and OPIDIN in the whole strategies Assessment of impact at different level (economic, ecological and governance.	The 3 strategies have been improved with relevant actions and implementation constraints 2 or 3 economic Instruments have been integrated to technical options to meet the specific objectives OPIDIN has been integrated to the strategies as technical options Assessment of impact.	Appreciation by participants the stake of AFROMAISON in terms of NRM and their link with biophysical element Learning from each other on local and regional context realities in term of governance, economic technique and technologies.	The strategies are now finalized. Next is implementation of strategies and stakeholders engagement
Internal evaluation	Dec 2013 – Jan 2014	To evaluate and assess the developed strategies and put them in a wider picture	AFROMAISON Mali Case study team	By drafting report and explicitly asking feedback on it within team	new insights about the strategies became evident that helped to formulate its strengths, limitations opportunities and threats	Internal strengthening of the value of the strategies and the AFROMAISON project	

- **Step** : name of the step
- **Timing** : when did it happen / start (month/year) – duration (5 days, 5 months)
- **Purpose**: what was the purpose assigned to the activity?
- **Actors involved**: be “specific” here we want to understand the difference between the arenas convened and the reasons why different arenas were convened. Actors include (actors at national, meso and community scales, district or other administrative unit, NGOs private sector, expert/research – who from Afm participated, champions etc.). Why did you do choose ?
- **Main contents**: especially for workshop (as different activities integrated within). we want to know how the activities as recommended by WP were actually ADAPTED to audience, context etc., how they were reframed in your intervention. you can refer to specific documents / reports for details if necessary.
- **Main substantive outcomes**: what did you got concretely out of the activities (please be specific how many maps types of maps, number of strategies etc.)
- **Main outcomes social capital /learning /relationships**. Do you think they were an outcomes in term of social capital/learning or relationships between actors?
- **Articulation**: to which other activities this activities contributed and how? how did it contribute from previous activities.

Lessons learnt by the organizers about the overall process? What went right ?What went wrong ?Suggestion ? what important contribution you think very important to make

Successes

- There was great interest from the meso-scale stakeholders to contribute to the various workshops organized in the framework of Afromaison. Developing strategies and actions on a level where they could be actively involved created ownership with the stakeholders.
- We were able to invite a sort of core group of stakeholders that attended most of the workshops above. This allowed continuation and a process memory which helped to build on earlier results
- We had stakeholder both from bottom-up community-based approaches towards INRM together with representatives of top-down governmental (regional) entities. Bringing them together in workshops resulted in a wide inventory of needs, opportunities and constraints with respect to INRM in the Inner Niger delta.
- The Wat-A-Game sessions were considered as really interesting by the attending workshops and this tool should be further developed and used in subsequent workshops. (Yes)

Challenges

- Some of the concepts used in this project like integrated natural resources management, vulnerability, ecosystem services and their values, economic instruments, strategies and operational frameworks are relatively abstract and complex. It was challenging to get everybody on the same level of understanding about these concepts.
- During the strategy development workshop there was a strong bias towards finding interventions that lead to improved income, food security and welfare. In that sense the strategies could be more considered as sustainable livelihood development (SLD) strategies than as integrated natural resources management (INRM). Obviously SLD and INRM are strongly connected and partially overlap. In the strategy development workshop, the focus was more on *People and Profit* than on *Planet*. INRM in IND and livelihood development are strongly linked to each other. Develop a clear methodology to keep them apart is challenging
- Sometimes professional workshop facilitation was difficult to organize resulting in lengthy discussions between stakeholders that went off track (rich and interesting but somehow encroaching on time). Some use could be made from these discussions which have been properly documented.
- It has been challenging to plan and conduct some of the workshop activities due the security reasons end of 2012 and early 2013

Suggestions for Improvement

- In terms of time, better planning workshops including care to facilitation and note-taking to achieve the purpose
- There is need to extend the timeframes for the workshop. For the 4 workshops the time has been a limiting factor insofar some key issues were not addressed sufficiently.

V Description of the approach(es) to select options

Types of options	Method of selection used and specification used	Basis of specification (especially if was adapted in your CS)	Expert input in definition and selection	STH input in definition and selection	What debate the selection or specification did generate which you think important to mention? What problem or issues arose?
Local techniques of restoration and sustainable management of natural resources	It was identified through a focus group with the 3 main socioeconomics groups in each of the 3 selected meso scale sites in the delta. Stakeholder identified the type and the cause of problem, management strategies to overcome, the application area, the results obtained and implementations techniques	-	2iE developed a questionnaire and a survey,	Stakeholders provides information on preferred local options to deal with food security, water security and ecosystems degradation issues	The people in the IND are aware of the fact that their environment is degraded. They take initiative to develop and implement techniques that help to stop this degradation.
Various options					
The implementation of the flooding forecasting tool OPIDIN and the dissemination of its forecast information	It was identified in various workshops and interactions with stakeholders in the entire IND (also outside of the framework of AFROMASION) that improve flooding forecasts were needed to make optimize livelihood activities and to reduce livelihood investment risks	This option was not selected by the meso-scale stakeholders out of a bigger set of options. The OPIDIN option was selected by DNH and the Dutch Embassy in Mali as a quick to be developed and implemented tool that would help IND-people with informed decision-making for their livelihood activities by means of flood forecasts.	This development was coordinated by DNH, Dutch Embassy in Mali, DRH Mopti, WI and A&W	Stakeholders were consulted about how and when flood forecast information was to be disseminated to them	DNH and the IND stakeholders wanted a tool which could be implemented asap and which is easy to operate and understand. OPIDIN had already been developed in earlier projects and promoted to the DNH.
Options included in the draft INRM strategies develop during the May 2013 Mopti Workshop	Stakeholders were informed about various types of options possible (spatial planning and decision making tools, sustainable land use practice economic incentive-based tools) Most of the options identified and selected during this workshop were generated during group discussions which had expert contributions from WI staff	Gross scoring of resources (financial / human / capacity / infrastructures / social agreement / political agreement) + roles and responsibilities (commune / cercle / region / national) + impact (individuals / community / governance / economic development / ecology)	WI experts informed stakeholders about potential options WI staff facilitated the options scoring, ranking and time planning exercise with the	Stakeholders discussed the applicability of various options and eventually scored, ranked and planned the selected options in the 3 strategies	The term "option" has been a matter of discussion. When an option is short term or middle term? The weight of an option in a given strategy The SMART characteristics of a given strategy has been another point of discussion

Types of options	Method of selection used and specification used	Basis of specification (especially if was adapted in your CS)	Expert input in definition and selection	STH input in definition and selection	What debate the selection or specification did generate which you think important to mention? What problem or issues arose?
Additional options from the Ouaga workshop	Additional options were extracted from stakeholders' discussion during the 1 st and 2 nd day of the workshop where all the specific objectives identified in Mopti have been systematically reviewed for preparing the EI discussion. Every time an option was mentioned, it was noted on a post-it. Later on, these options were discussed, reformulated and completed.	<p>In Ouaga : Scoring of priority on 4 types of resources : money, training, individual will, political will</p> <p>In Ouaga : Evaluation of needs for different types of resources at different levels (not completed) : [individual / community / regional services / state / development partners] X [money / training / political will / individual will] + space extension + time frame</p> <p>In Sévaré options were classified in 6 themes [Fishing / Agriculture / LS / LH / Conservation / general]. For each thematic 5 types were specified with slightly different criteria : [technical / practical : who is developing / who is benefiting / what is needed / who is funding] [organizational : who is organizing / how is the organization done] / [statutory : how to implement / what resources / who funds] / [informational : who is trained –informed / who is training / who is funding].</p>	Expert options from previous workshop were included	All additional options were mentioned by the workshop participants	<p>In Ouaga: The significance of the time frame was a bit ambiguous because start time and duration were somehow mixed. The discussion on the resource needs at different levels was also ambiguous as sometimes it was not clear whether we were discussing who would need or who would provide the resource. Only very few options were not selected by the participants.</p> <p>The identification of additional options in Ouaga and the finalization status or not of the strategies from Mopti might have been confusing for some people. The Sévaré workshop was certainly useful for the re-appropriation of these additional options within the strategies.</p>

Innovation : did the process help emergence of innovation (for example innovative option compared to options already tested and promoted or the way options were being used, or the way people link them to other dimensions, or what they did consider in the option)

The use of the Wat-A-Game tool to test the various options was considered as innovative and useful by the stakeholders that were involved. However there was scepticism over the fact that the game could be used with lay stakeholders because of its complexity.

The technical options discussed and selected are rather conventional land and water use management and agricultural practices. For some of the technical options (especially digging of new and deepening of existing canals) the environmental sustainability is questioned.

The financial incentive based options are considered as innovative. Wetlands International already has experience with the bio-rights approach which is an environmental subsidy.

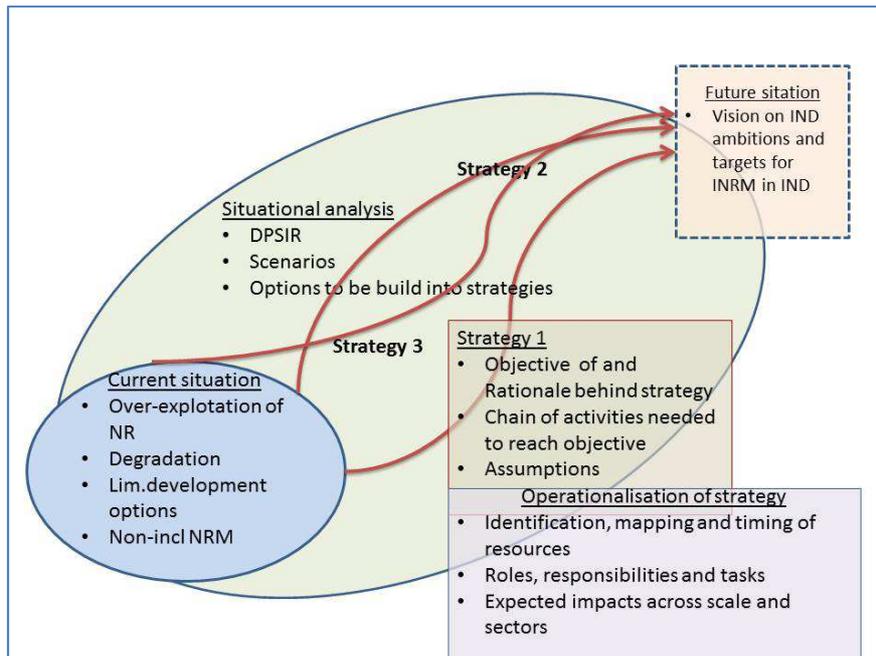
VI "Building/ crafting of the strategies" (strategy = a set of options of different categories)

Description of the Theory of Change approach used during the strategy development workshop in Mopti 2013.

During the Mopti workshop in 2013, A Theory of Change approach was used to develop meso-scale strategies to improve the IND Integrated Natural Resources Management. The theory of Change is increasingly used in especially the development sector. The quality of this approach lies in the fact that it systematically and step-wise builds a strategy by translating visionary thinking into much more concrete thinking. Basically the approach follows following logic:

- 1) Define the reason for improvement by describing a current unwanted situation (like unsustainable use of natural resources in the IND and people being in a poverty trap).
- 2) Define the desired state of a future situation in a vision like statement (like increased welfare for the IND people based on sustainable livelihoods and by specifying that future situation in a number of clear objectives
- 3) Perform a situational analysis by map issues and causalities using tools like problem tree analysis, DPSIR analysis, stakeholder analysis, mapping of institutional landscapes
- 4) Define where interventions in this situational landscape are best placed to reach the desired state knowing you own possibilities and limitations
- 5) Define a strategy for that entry point
- 6) Operationalize the strategy

This process is depicted in the next graph:



Steps 5 and 6) follow this logic

7) The definition of the strategy starts by defining a very specific objective (Smartly formulated). Meeting the specific objective is assumed to contribute to one of the objectives formulated for the desired situation.

8) Then a strategy rationale (justification) is shortly described (why is this needed and why is this going to work)

9) The strategy consists of a number of options and/or chains of actions. By doing these actions and applying these options it is assumed that the specific objective can be met

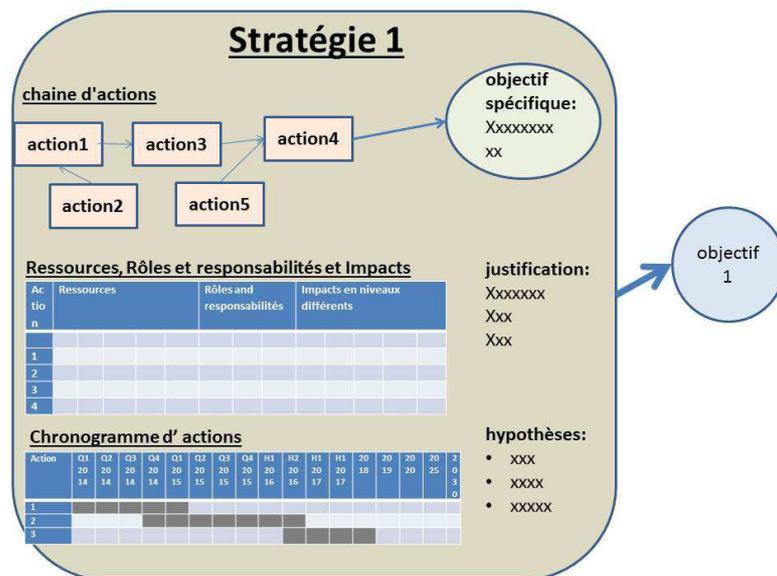
10) Uncertainties about the feasibility and effectiveness and possible risks and constraints are explicitly discussed and formulated as assumptions (like civil unrest will stop and rule of law is re-established such that governance structures function normally)

11) The final step of the strategy development is by developing an operational plan.

12) Which resources are needed to be able to implement the strategy and carry out the options and activities, whose responsibility is it to oversee and execute the strategy and where are impacts foreseen

13) Further operationalization of the strategies takes place by setting deadlines and planning activities

The graph below shows the different ingredients of a strategy. In this graph, the chain of actions is what in other case studies is called the group of options.



More information on the Theory of change can be found at:

<http://www.theoryofchange.org/what-is-theory-of-change/#6>

http://r4d.dfid.gov.uk/pdf/outputs/mis_spc/DFID_ToC_Review_VogelV7.pdf

<http://www.lse.ac.uk/internationalDevelopment/research/JSRP/downloads/JSRP1.SteinValtersPN.pdf>

The exact process followed in the Mali Case study and the resulting 3 INRM strategies at the meso-scale are described in: RAPPORT DE L'ATELIER SUR LE DEVELOPPEMENT DE STRATEGIES POUR LA GESTION INTEGREE DES RESSOURCES NATURELLES DANS LA VISION DU PDD - DIN A L'ECHELLE MESO DUDELTA INTERIEUR DU NIGER DANS LE CADRE DU PROJET D'AFROMAISON, Mopti du 22 au 24 Mai 2013, salle de conférence du Conseil Régional , which can be found at EMDESK.

Has the building of the strategy lead to any discussion or debate or differences between types of actors important to mention (difference/similarity/connection etc.)?

The building of the strategy aroused discussion and debate impacting thus the workshop timing. The discussion is mainly focusing on stakeholders' interest in term of activities sectors. Each of them tries to defend his activity sector and to show the weigh in the economic balance, its connection with other sectors as well as their vulnerability to conflict and drivers. In a post-workshop setting, some INRM experts of the AFROMAISON case study team have criticised the environmental sustainability dimension of some of the proposed options

What were the main issues faced when building the strategies?

- One of the issues faced was the short time frame used by the stakeholders. The implementation of the proposed options and the deadline of the strategy objectives to be reached are mostly within a time frame of 5 years. Thinking about processes that go further than 5 years has been difficult.
- The strategies build more towards sustainable livelihood development than Integrated Natural Resources Management
- During Ouagadougou workshop, the evaluation of role, resources and responsibilities for the additional options which was confusing
- During Sévaré workshop the impact at different levels

VII Combining different assessment approaches of the strategies

Evaluation approach used (from different the WPs)	Main characteristic of the approach as used in the CS	Main outcomes / results	Was the outcomes results presented to meso scale actors and how ?
Testing of the INRM strategies has been limited to only one game session. For this the Business as Usual scenario was used and different participating stakeholders performed their roles in the game. The final outputs have been compiled in a monitoring table used for debriefing.	Very participative approach in which each stakeholder has played his role. Very inter active approach between the stake of natural resources users and identification of conflict sources.	Considering that because of the security issues, this was the first time the game could be used with stakeholders, a lot of time was spent discussing the game and how it could be improved and finalised. It was a bit short and the calibration of the game was too loose for really testing the strategies. Some points were acknowledged though : diversification is an efficient individual strategy to adapt to resources degradation, difficult issues with size of herds and getting dioros into re-questioning the management of their pastures, long-term sensitization needed for changing mentalities, helpfulness of private investment but difficulties to get them because of the instability of the DIN resources	Not so far
Confronting the strategies with the scenario descriptions as developed by PIK (climate change plus future dam operations) and assess strategy robustness	This is an expert judgment, carried out by WI. It is an qualitative assessment that leads to an narrative describing how the various scenarios are covered by the proposed INRM-strategies	An narrative per proposed INRM-strategy on its robustness under different Inner Niger Delta scenarios	No, the robustness assessment has not been shared with the stakeholders. However, stakeholders had been informed about different scenarios before they started developing the strategies

Were they any attempts to articulate/coordinate the results of the assessment with other methods or provide a synthesis? If so how ?

- No

VIII Narrative for the strategy

Strategy 1: Ensure water access and control in the Inner Niger Delta to support agroforestry and pastoral facilities while meanwhile conserving biodiversity

The rationale behind this strategy is that the IND's food security level is relatively low which keeps people vulnerable and trapped in poverty. One of the causes of the IND's low food security is the low efficiency of some of the food production systems. Secondly, the carrying capacity of the IND to produce provisional ecosystem services (rice, fish, and pastures for cattle) is strongly dependent on the Niger River Basin's flood regime. That flood regime is dynamic with periods of droughts and floods. Limited certainty on these flood dynamics increases people's livelihood investment risks and results in sub-optimal yields and livelihood revenues. In times of low food provision, people tend to diversify livelihoods to bird catching, which adds to the degradation of biodiversity and ecosystems. In times of scarcity and due to over-grazing, over-fishing, and land and water access issues, conflicts between different user groups sometimes grow. Better and sustained access to water resources and being able to overcome periods of prolonged drought is assumed paramount in improving food security in the area.

Hence this strategy is based on building water management infrastructure, improving the productivity of some of the water-dependent food producing systems combined with improving knowledge on the flood regime and using innovative economic incentives based on behavioural change.

For this strategy to become successful continued secured access to lands, political stability in the region, continued rainfall in the upstream region and adherence of local users and stakeholders to proposed rules and regulations are deemed necessary by consulted stakeholders.

This strategy is based on a number of technical options that increase the access and control over the water resources on a meso-scale in the IND. Digging out new channels and deepening existing ones between the Niger River natural stream channels and the locations where water is needed will get some of the villages out of its water isolation and extend the time that people are able to access the river runoff in times of low flood levels to meet their water demands.

Development of water storage ponds creates water buffers to sustain dry periods. Such water ponds could have multi-purpose function and facilitate aquaculture as well. Yields of the traditional flood-recession based rice cultivation could be greatly increased by introducing (auxiliary) irrigation. This could be both gravity and or energy-based irrigation. Development of (groundwater-fed) pastoral wells increases the cattle watering potential and reduces conflicts when cattle in times of water scarcity sometimes use other water sources.

Besides the initial development of water infrastructure, mechanisms should be put in place to ensure its maintenance, for example in an integrated management scheme. With the fact of many of the livelihood activities being strongly dependent on flood levels, prior knowledge of these levels and timing is important for people to avoid regrettable livelihood decisions.

The implementation of the flood forecasting tool OPIDIN in IND's regular water management system and the dissemination of flood forecast information to different groups in the IND (using multiple ways of communications) is a great step forwards. Various economic incentive-based instruments are suggested to make some of the livelihood activities less environmentally adverse. People are aware of the fact that part of the area is already over-exploited. Voluntary environmental agreements, user charges, use rights, environmental subsidies (like Wetlands International's bio-rights scheme) and to a lesser extend performance bonds were suggested as potential instruments to deal with issues of over-fishing and over-grazing and to secure access to land, pasture and water.

According to the local stakeholders, implementation of such a strategy is mainly depending on the availability of financial resources and to a lesser extent on human resources, community-based and political adoption of the strategy. The responsibility and roles in the operationalization of the strategy is mainly at community level. Activities to have this strategy implemented are assumed to start within 2 years.

Strategy 2: Adopt response options for mitigation and adaptation to climate change in the IND

The rationale behind this strategy builds on the first strategy. The number one issue to address in the IND is to improve the basic food security situation. However, on top of that the people in the IND need to adapt to climate change impacts and build resilience to overcome environmental and climatic shocks. Recent climate modelling studies predict higher temperatures for the IND region. The multi-annual averaged precipitation in the IND and Upper Niger is assumed to remain fairly constant however with a larger variability between wet and dry seasons and wet and dry years. Adapting to climate change means in this case for example reducing the extra evaporation resulting from the elevated temperatures and securing water use in time of droughts (by means of water storage and transfer). Building resilience in the communities can also be done by diversifying livelihood and by building financial capital using value addition of agricultural, silvo-pastoral and fisheries produce.

For this strategy to become successful continued secured access to land, political stability in the region, continued rainfall and adherence of local users and stakeholders to proposed rules and regulations are deemed necessary by consulted stakeholders.

This strategy is based on a number of technical options that potentially increase the access and control over the water resources like in the first strategy. Additionally, using crop varieties adapted to elevated temperatures and being more drought resistant in combination with other technical intervention that reduce evapotranspiration like mulching, wind reduction fencing and shading are proposed. Development of gardening and fruit production diversifies the existing common livelihoods portfolio in villages. Value addition mechanisms are proposed like storage and processing facilities for a number of the livelihood produces.

Improving infrastructure and transportation of the value-added products to markets is assumed necessary to develop the financial capital. To reduce the pressure on natural resource systems that help sustain fishing stocks and other biodiversity, a reforestation of the flooded forest areas is needed. Creation of silvo-pastoral perimeters (3000 ha) in the drier forests at the border areas of the IND will reduce residence time of cattle in the bourgou fields. These areas are called in French 'Zone d'attente' (waiting zones). It will improve their diets with other types of grass and ligneous material from trees and protect them from sun and heat.

With the fact of many of the livelihood activities are strongly dependent on flood levels, prior knowledge of these levels and timing is important for people to avoid regrettable livelihood decisions. The implementation of the flood forecasting tool OPIDIN in IND's regular water management system and the dissemination of flood forecast information to different groups in the IND (using multiple ways of communications) is a great step forward. OPIDIN has not been tailored to develop forecast under climate change.

Various economic incentive-based (EI) instruments are suggested to make some of the livelihood activities less environmentally adverse. People are aware of the fact that part of the area is already over-exploited. The EI instruments proposed to be tested and implemented to address issues of overfishing and overgrazing and to secure access to land, pasture and water are: voluntary environmental agreements, user charges, Use rights, Environmental subsidies (like WI's bio-rights scheme) and to a lesser extend so-called performance bonds.

Implementation of this strategy needs financial resources, human capacity and social agreements. The responsibility and roles in the operationalization of the strategy is mainly at community and regional level. Activities to have this strategy implemented are assumed to start within 2 years.

Strategy 3: Strengthen the technical, organizational and financial capacity of 80% of actors in 3 communities in the IND by 2020

Improving the integrated management of natural resources at the meso-scale based on bottom-up community-based approaches cooperating with top-down governmental approaches needs capacitated people and organisations. Implementation of many of the technical options as proposed in the earlier strategies lie mainly with the communities (with governmental entities then creating the enabling environment). Hence developing the capacity in the communities is of paramount importance

For this strategy to become successful continued secured access to land, political stability in the region, continued rainfall and adherence of local users and stakeholders to proposed rules and regulations are deemed necessary by consulted stakeholders.

Two types of capacity building are identified. Firstly, technical training on sustainable land use practices, water resources management, agricultural practices and the conservation of biodiversity is deemed essential. Additionally this could be complemented with trainings on disaster risk reduction, climate change adaptation and trainings on sustainable livelihood development, entrepreneurial skills and value-adding changes technologies.

The second element in this strategy is building and further organizational strengthening of community-based natural resources use and management entities. These organizations could be developed for the fishermen, pastoralists and rice-farmers. Such organizations should respect traditional structures but not exclude the reality of an increasingly globalized and connected world.

Furthermore the organizations should be able to operate in the wider institutional landscape together with governmental entities, NGOs and donor organisations. Such community-based organisations could be trained in issues of gender and social inclusion, monitoring and enforcement of communal rules and regulation, execution of the proposed economic-incentive based instruments, market access development, monitoring of ecosystem services (like the stocks of fish) and health of ecosystems (like the areas of flooded forests), coordination of communal disaster risk reduction (DRR) and climate change adaptation (CCA) activities and conflict resolution mechanisms. Besides organisational skills, such community-based INRM organization need resources and assets to be able to run as an organization (office space, transportation means, communication means etc.). Part of the strategy is dedicated to secure these financial means.

According to the local stakeholders, implementation of this strategy is mainly depending on the availability of financial resources and to a lesser extent on human resources and community-based and political adoption of the strategy. The responsibility and roles in the operationalization of the strategy is mainly at community level. Activities to have this strategy implemented are assumed to start within 2 years.

IX Commitments of actors and perspectives

Actors with whom commitment where reached	What did they commit to?	Specific approach used to get this commitments	Is there any specific activity that you think worth mentioning about being essential for those commitments?
Direction Nation de l'Hydraulique and the Dutch Embassy in Mali committed themselves to help further develop OPIDIN, embed it in the regional water management structures	A new project proposal to be funded by the Dutch government	Cultivation of network	?

What are the perspectives the follow up and implementation of the strategy?

The important role of IWRM and INRM is recognised in the Strategic Development Plan for the Inner Niger Delta (PDD DIN), which was recently (2011) presented under the umbrella of the Ministère de l'Environnement et de l'Assainissement. The general objective of the PDD DIN is to '*Construire et développer une Vision partagée autour des priorités de lutte contre la pauvreté et du développement durable dans le Delta Intérieur du Niger*'. The PDD DIN is based on a solid assessment of the current hydrological, socio-economic and ecological situation (Etats des Lieux), and a shared vision of the future of the IND of national, regional (and local?) stakeholders (vision commune).

However, the PDD DIN is only still a plan, a vision on an abstract level without operational plans and without the operational capacity and the resources to have it further implemented.

The Dutch government is currently developing an IWRM plan together with the Malian government. It is assumed that the strategies developed in AFROMAISON for the IND might eventually be included in these IWRM-plans. WI is currently advocating for that to happen.

X Suggestion concerning WP7 activities and work

Do you have any other suggestion or comment regarding Afromaison WP7 activities and work?

- Finalize the Wat-A-Game game
- Testing strategies with the Wat-A-Game game including Els and OPIDIN
- Use the Wat-A-Game for further stakeholder engagement
- Presenting the AFROMAISON INRM-strategies on the meso-scale in combination with other (earlier developed, and at other scales developed) INRM, IWRM, sustainable livelihood development, rural development, Disaster Risk Reduction and Climate Chang Adaptation strategies on international platform as only in total they seem to cover the full solution to IND's issues.

12 Annexe 12: WP7 synthesis by case study by case study team - Fogera/Blue Nile

I. General information of the case study (rapid description).

Semi-subsistence agriculture, including important livestock component, in area with rapidly increasing population and significant land degradation issues (deforestation and loss of land cover, erosion, water quality degradation). Range of livelihood systems: rice, fish, millet, livestock around lake; cereals and livestock in uplands.

Meso-scale in your CS:

What is it?

Small catchment (Gumera watershed approx 2000 km²). Incorporates most of the Fogera woreda (administrative area – 1088 km²) in lowlands. Biophysical analysis mainly on catchment basis; socio-economic work(including game) based on Fogera woreda

What are its functions in regards to INRM?

Village (kebele) to district (woreda) scale land and water management. The kebele administration plays a decisive role in terms of local governance. This role includes: identifying problems; designing areas of intervention and for community action; developing regulations related to resource use; identifying target groups for food aid, food for work, rehabilitation schemes and credit; regulating tax collection and credit repayments; ensuring security; and resolving other minor legal issues. Woreda is the lowest level at which regional and national government agencies operate – ie link between local and national scales.

Broadening to catchment is needed to capture upstream /downstream dependencies and links

Why did you choose this territory? What were the determinant of your choice?

One of 3 case study areas for the Nile Basin Development Challenge (NBDC) – nested scales (Blue Nile basin – woreda) – see below.

II The context of the implementation of the Operational Framework

Presentation of the “context” of the OF implementation, that is the connection with other projects, programs and interventions.

Nile Basin Development Challenge – ongoing joint CGIAR project under CPWF and WLE (mainly ILRI and IWMI with multiple partners) <http://nilebdc.org>

- NBDC initiated innovation platforms for NRM at three scales (local, regional, national) – these structures were used as basis for Watagame -
- Explored strategies for land and water management at regional scale (Blue Nile) – suitability analysis for SLM interventions.
- hydrological analysis of impacts of RWH carried out in very small sub-catchment (Mizewa – 27 km²) and SWAT modeling underway for whole Blue Nile basin.

Improving Productivity and Market Success of Ethiopian Farmers <http://www.ipms-ethiopia.org/> - a five-year project funded by the Canadian International Development Agency (CIDA) and implemented by International Livestock Research Institute (ILRI) on behalf of the Ethiopian Ministry of Agriculture (MoA).

UNESCO-IHE students working in the catchment -

NOTE: **On-going government initiatives** in Ethiopia to combat land degradation and improve land management through state sponsored construction of contour banks, rainwater harvesting ponds etc . Programs are active in the woreda, often with a mandatory labour component. Any coordination would be through district agriculture department (DA officers are active in the Watagame process).

How was the coordination done between the OF and other(s)s program(s) ? What mechanisms were used: meetings (with whom, how many/how often); presentation of AfroMaison work (with whom), participation (what kind) of participants from other program(s) in AfM events; etc.

AfM and NBDC ran joint workshops for Watagame, coordinated by Beth Cullen (ILRI) – this aspect of the project was a seamless collaboration. Workshops were organized by a joint team from ILRI, IWMI and IRSTEA. All objectives, tools and methods, agenda and monitoring and evaluation process could be jointly agreed by the 2 projects' representatives.

Other components of NBDC coordinated through shared project staff (mainly Katherine Snyder, Simon Langan).

UNESCO-IHE students working in the catchment - links with AfM coordinated through Ann van Griensven, and participation of students in AfM meetings.

II. General presentation of the different stages of the OF adapted to your case study

What were the main/key steps ? (Shared diagnostic, Visioning exercise sharing, Option identification, Option selection, Building of strateg(ies), Test of strategies and the different methods used to test them , implementation plan of the plan etc)

Workshop 1

- Use of the game
- Identifying and prioritizing focal issues
- Listing of practices
- Filling in practice sheet
- Selecting practices and organizing them in space and time (planning)
- Resources needed for the strategies
- presenting strategies

Workshop 2

- Reviewing the 2 broad strategies
- Refocused Focal issue: free grazing
- Time frame and future visioning
- 2 Refocused strategies
- Merging the refocused strategies
- Specifying the practices, barriers and solutions

Workshop 3

- Presentation of 2 case studies for intro. game and farmers issues
- Play the micro-game at farmer level
- Constraints and incentives and equity at farmers' level
- Presentation of 1 case study for introducing DM issues
- challenges and constraints of decision makers
- Incentives, support and recommendations
- Implementation plan
- Presentation of the implementation plans of each group
- replication / upscaling / integration
- way forward, establishing committee, roles and responsibilities, partnerships

Each workshop was accompanied by a monitoring and evaluation protocol.

When were each steps developed (timing and agenda) ?

Three workshops:

1. 12-14 Dec 2012
2. 23-24 April 2013
3. 17-19 Sept 2013

What objectives did you assigned to each key step precisely?

Workshops were used to

1. Identify priority issues for community and longlist of relevant interventions. Decision to focus on free grazing and exclosures.
2. Formulate a more specific strategy including all 3 landscape areas (up, mid, and lowland) – see Workshop 2 report
3. Finalise strategies and provide ex-ante assessment from Watagame + discuss the Implementation of the sgstrategies – see Workshop 3 report.

For each steps who were the actors mobilized?

Participants a mix of farmers and local decision makers (local and regional government)

Workshop 1: 52 participants: about 26 DM, 26 farmers (17 women)

Workshop 2: 36 participants: about 15 DM, 16 farmers (9 women)

Workshop 3: 50 participants: 27 DM, 23 farmers (9 women)

The third workshop paid a more thorough attention to participants' selection in order to include stakeholders from the region who would play a key role in implementing the strategy in the future (religious leaders, farmers not used to participate in such workshops, etc.)

How where the different steps connected with each other?

What were the contents of each step (method and approach used etc)?

Main tools and methods used:

- Meso and micro games
- Practice sheet
- Planning matrix
- Matrix detailing the practices, barriers and solutions
- Implementation plan matrix

Other group discussion and facilitation techniques:

- Ranking allocation priorities (Prioritization of practices with limited amounts of resources)
- future visioning exercise
- world café

What were the main outcomes :

- *In term of substantive content*

Workshop 1:

- Two preliminary strategies proposed - see Workshop 1 report (1 for Decision-makers and one for farmers)
- List of detailed practices

Workshop 2:

- 1 commonly-agreed focal issue: controlling free grazing

- 1 refocused landscape-shared strategy
- 3 Matrixes on Strategy detail, implementation, barriers and solutions for each part of the landscape (up, mid and lowland)

Workshop 3:

- 3 implementation plans for 3 pilot sites in each part of the landscape (up, mid and lowland)
- Established committee with clear roles and responsibilities attributed

- *In term of social capital content (network etc)*

Learning about each other's constraints, specifically in terms of skills, timing, and availability of resources

Discussions on the need of awareness-raising for both groups

- *In term learning process for the participants*

Learning about upstream/downstream relationships, alternative economically-viable practices to control free grazing, etc.

Lessons learnt by the organizers? What went right ? What went wrong ? Suggestion ?

Problems of staff turnover: no focal person in IWMI responsible for AfM work after Mulugeta left

Internal interpersonal issues within the team (linked to various factors among which problems for combining the 2 OFs, time issues, cultural differences, the issue listed above, etc.)

Need for more time for preparing the workshops (highlighted by almost all team members)

Time keeping difficult during the 2nd workshop (use of a bell In the 3rd workshop that allowed to diminish facilitation interruptions)

Good M&E of the process thanks to a very professional team in that regard + a thorough attention and means allocated for that purpose by both projects

Half a day consecrated at the end of the 3rd workshop to plan the way forward, increasing the likelihood of strategy implementation

Note: Two different approaches at different scales: AfM at woreda scale; NBDC at basin scale

NBDC was already in place prior to start of AfM, so did not explicitly use the AfM operational framework, although a compatible process was used, based on consultation through innovation platforms.

IV Description of the approach to select options

Who was involved in the specification or description of the options/actions (resource need and possible outcomes) ? On what basis was done this specification?

Options/Practices were identified through individual reflection + brainstorming (workshop 1)

Facilitators introduced 'Happy Strategy' practices (previously identified by experts/researchers through NBDC project) that were selected by participants based on their relevance to the focal issue and added to the practices previously identified. (workshop 1)

Specification of practices was made by participants in small groups (workshops 1&2)

Who was involved in the selection ? Has expert been involved at some point of the selection ? How ? What kind of involvement of other WP?

Selection of practices was made by the stakeholders themselves supported by the facilitators. Local experts were involved (as participants)

Other WP were solicited to react on the list of practices but never feedbacked.

Has the selection lead to any discussion or debate worth mentioning – or differences between types of actors?

Yes, many discussions and debates about timing of implementation, resources needed, etc. (cf reports)

What method were used (especially when CIRAD participants were not present) to select the options?

Use of the game board and a matrix to select and organize the practices in space and time

has any innovative options compared to existing ones (already tested and used) been selected? which one ?

V Description of the step "building of the strategies" (a set of options of different categories)

Who (what actors) was involved in the building of the strategy ?

All participants (farmers and other community members, local government officers, local researchers) supported by the team. Mesoscale actors involved were district and regional government officials, who participated in the process. NOTE that the regional scale (Gondar) was not included.

What approach or method was used to build the strategy ?

- Planning matrix
- Matrix detailing the practices, barriers and solutions
- Ranking allocation priorities
- Game board

Strategies were formulated using Watagame as part of the decision process.

Was the strategy spatialized and presented in a time frame ? what method was used to do so?

Strategy was spatialised for upper – middle and lower landscape zones. Short, medium and long term actions were identified (though specific time frames were not put on these). An implementation plan for the next year was developed (see below).

see above

Has the building lead to any discussion or debate or differences between type of actors ?

Discussion / debate and issues faced are covered in the 3 workshop reports.

What were the main issues faced when building the strategies?

What were the method for evaluation used? Especially for assessment method which are not the game

- *rapid presentation of the method(s),*
- *main outcome(s), result(s),*
- *How was the results presented/discussed to mesoscale actor(s)*
- *if presentation, how was the coordination with the other methods including social simulation (the game) organized ?*

The game was not played in evaluation mode for the final strategy – so no formal assessment of outcomes was made, though this was implicit in earlier rounds of the game.

Perspectives

What are the perspectives concerning implementation of the strategy?.

Outcome of Fogera workshop included an implementation plan for the next year [in 3 pilot sites](#). A committee was formed, mainly from research partners, district and local govt officials to formulate an Action Plan for 1 year of activities from the strategy, focusing on grazing management.

Local people are committed and have offered labour and support from government agencies, but need financial support for fencing, equipment, meetings etc. Write development project and look for donor – financial support.

Administrative support is still needed from NBDC and AfM teams for the creation of the committee ((group e-mail / drop box for the file sharing / etc.) + for the development of a common **ToR** to define the roles and responsibilities of each committee member + **official letter** attached to it and sent to each organization to inform

Next step is to write grant proposal, and find suitable implementation partners (possibly NGOs working on rural development).

Collaborations are already foreseen with local initiatives:

- Inputs on the LRDA "**Guidelines** of communal grazing land management, development and utilization"
- Collaboration on **LRDA ws** (2nd quarter of this year. Obj = present the guideline and get feedback from key actors)
- Collaboration on **BDU ws** (oct-nov. Obj = create awareness on free grazing at regional level)
- Collaboration on **Andassa 15th anniversary ws**.

Fogera is the only site (of three where workshop have been held) to progress to implementation plan. Three workshops were held in Fogera, only one in the other location. It seems that time is needed to test and question the strategies between formulation and testing.

Suggestion concerning WP7 activities and work

Do you have any other suggestion or comment regarding AfroMaison WP7 activities and work?

I think the joint work between the 2 projects should have been formalized at some point. This would probably have eased the team work and ensured better recognition of all team members involvement on both sides.

13 Annexe 13: WP7 synthesis by case study team – Rwenzori

I. General information of the case study (rapid description, what are the stakes, why does it matters?).

Mountainous/ Hilly

A variety of natural resources wetlands, wildlife, forests (but under anthropogenic)

More than 2 million people. Majority small holder farmers

Over 30 CBOs, NGOs, and Internal agencies working toward natural resources management with specific areas of intervention.

II.Meso-scale in your CS:

What is it?

Rwenzori region: 7 districts, geographical size is approximately 2600km². The district has the administrative mandate for management but region is not an administrative unit.

What are its functions in regards to INRM?

Districts have mandate to implement the policies, monitor resources use in non-protected area (mandate) => but work is concretely done by several organizations and several NGOs working in particular districts or sometimes in a number of districts within the region.

In protected areas, resources management is done under government responsibilities through parastatal entities

Numerous regional forums exist; They gather organizations. Organizations have different activities some of them linked with natural resources management.

Why did you choose this territory? What where the determinant of your choice?

Homogenous area in term of Geographical characteristics and future influence of climate.

III.The context of the implementation of the Operational Framework

Presentation of the “context” of the OF implementation, that is the connection with other projects, programs and interventions

Rwenzori development framework : it is a governance structure which has been initiated by NGOs civil society organization to plan for the development of the region. They provided a “Code of practices”, It also has a steering committee. Organizations are members of the framework which count on 4 pillars for development. One organization is in charge of each pillar. Within any pillar all organizations meet regularly, and report regularly to the steering committee. The pillars 1 (increased production, food security, access to markets and household incomes) and 4 (environmental sustainability) are particularly relevant for AfroMaison because they are linked to the focal issue for the case study which is to attain food security and higher levels of income through sustainable natural resource management.

At district level there is an environmental forum in one district(Kaborole): This brings together organizations in one district to prioritize conservation interventions and NRM interventions.

How was the coordination done between the OF and other(s)s program(s) ? What mechanisms were used: meetings (with whom, how many/how often); presentation of AfroMaison work (with whom), participation (what kind) of participants from other program(s) in AfM events; etc.

The lead organizations of each pillars were engaged by AfM in the detailed process of AfroMaison. They were especially invited to the workshops we organized, involved for example in option selection or DST. They were also involved in the plan building. We also presented in one of the meeting process the planning process and outcomes so that the AfM plan could be incorporated in their plan but this requires engaging the lead organizations of the Rwenzori region development framework.

IV Chronic of the different steps of the CS work (all WP activities not only WP7 study)

Step s/activit y	Timing	Purpose, objective assigned	Actors involved	Main contents of the steps	Main outcomes substantive	Outcomes Social capital / learning / relationships	Articulation with other steps/activit y
baseline	2011 july -> march 2012	To assess the current context and the gaps that the Afromaison project require to address.	Informed in provision of information, (district, NGOs,) First draft were given to actors for comments (+ community for comments through representatives of farmers)	Diagnostic geographical area, physical, policies in place	Knowledge that they were policies in place, that STH knew about them and what should be done but it was not implemented. many NGOs involved in INRM but activities not coordinated Implementation failure	We were able to identify the NGOswe could work with, the ones that had done a lot of work of the region	
Regional workshop	April 2012 5 days	To introduce the Afromaison project to the stakeholders and conduct the process of strategy development and tool identification and assessment	District leaders, NGOs, private sector representatives, representatives of farmers association, Environmental officers (district level) ICRAF, Simon; Fonda, Nils, Emeline	Give overview of AfM Get their views on baseline study Assessment of information Identification drivers and how they are interlinked, Identification of different options Proposing strategies bringing actions together at households, community regional and national (3 strategies) STH input on DST (economic tool)	3 strategies produced Key and indirect/direct drivers of use and management of NRM which constituted the scenarios Inputs into the baseline (mostly clarification of some of the content)	Recognizing a new process is being started in the region by other actors, mobilizing them to participate in it.	
Sharing intervention with WP3	July 2012	Link the identified interventions with descriptions in the literature	Robyn and MMU team	Identification of detailed possible interventions	For different possible action, literature support which allows to complete the description of the action		Action were being identified by previous workshop
Preparation of the mpan game	July 2012 (2 months)	Game finalization	Same people that wsh1, including some that did not participate. Was a way to submit the strategies to them + Nils, Emeline, Geraldine	Creation of the activities cards for Mpangame=> operationalization of the strategies into Mpangame Formulation and testing of the actions	Inputs into game final improvement , but also input in the 3 strategies,	It contribute to participants recognizing that different resources users can work collectively	

Steps/activity	Timing	Purpose, objective assigned	Actors involved	Main contents of the steps	Main outcomes substantive	Outcomes Social capital / learning / relationships	Articulation with other steps/activity
Input on ES and ES mapping	Start date February 2013 Duration 1 month	ES mapping	WP5 Dirk	Further defined change in land use with focus in deforestation	maps		Maps were used in further defining the scenarios, and what could happen but they were no direct use in strategy definition or building
Scenario exercise	March 2013	Scenario building exercise	15-18 Representatives of few NGOs, including pillar leaders (of RDF), key private practitioners. It was not the same attendant than other workshops MMU, (PIK could not attend as they were informed too late of the meeting) Globally this arena can be described as more technical and less regional than other	Drivers identification, conceptualizing concept maps	Refining of drivers, making the concept maps describing the of functioning and the interaction INR, interaction => was then sent to PIK for comments	Was crucial for bringing on board the pillars as it was at this stage that they were invited as pillars and not organization., An interesting Learning process for MMU in organizing, and leading exercise Important to go beyond obvious factors and going to the roots of the problem (cultural for example) as well as acknowledging the interconnectedness between factors obvious Awareness of the importance to put interventions in context of scenarios and long term development which often not considered	Connection between factors Of the importance to mobilizing other types of actors
Running DST	May 2013	To identify potential instruments that could be implemented in the case study	Same people than scenarios exercise		Economic instrument identified MMU selected then 4 instruments	Help mobilizing more people on the approach as the whole as well training them in using this DST for planning	connected mostly with the DeMax later on

Steps/activity	Timing	Purpose, objective assigned	Actors involved	Main contents of the steps	Main outcomes substantive	Outcomes Social capital / learning / relationships	Articulation with other steps/activity
Series of Game workshops	Nov 12 April 13 -	Local level => to enhance change of behaviour) Regional level to engage actors / enhance participatory planning	1 st some communities games => regional (First and second game session "business as usual" + debriefing 3 rd game session "suggesting actions" + use actions from meso-scale strategies	Commitments on taking resolution and commitment to implementation resolution, Families commitments, "ex I will plant tree" Commitment of leaders, "to disseminate information for example" ⇒ All statements are recorded and reported Statement	Pillars were part of the training Political leaders mobilized Help to Bring together NGO and gov/com, induced enhanced working, pushing cooperation and coordination between the Enrolment of SATNAT was instrumental as it has many organization members which permitted to reach a very large number (all) of communities Raising Awareness and what works	
Evaluation ecosystem service	Feb 13 to march 2013	To identify the ecosystem services provided by different land units in the case study	MMU team	Identification of the ES services based on land use	Definition of ES in the CS Identification of their changes if any		Now we need to link ES services with the interventions
Workshop Identification of 4 scenarios	January 2013	2 nd stage after input PIK	Same people that 1 st workshop scenarios logic develop Initial development of the scenarios		4 scenarios built Scenarios assumptions for each scenario Different strategies – local strategies	Same as DST	We need to Combine strategy x scenarios
Workshop	July 2013	Regional again => Merging local and regional strategies	Same people as 1 st workshop + members SATNET organisations, from the communities processes (as facilitators and rapporteurs,	First game session "business as usual" + debriefing 2nd game session "test of the plans" + debriefing Modifications of the plans according to the outcomes and learning of the 2nd game session	1 strategy defined in terms in place (upland, lowland midland) and time (short term a year, mid term 3 years) by merging 3 initial strategies + inputs from communities games	Bridging local and regional level Before we had each level blaming each other for failure of implementation => this helps to get each other to understand each other. Also to perceive that activities at local level has impact higher level, the role of political issues of higher level (fear to lose vote) Building a cohesiveness and articulation between the two levels	

Steps/activity	Timing	Purpose, objective assigned	Actors involved	Main contents of the steps	Main outcomes substantive	Outcomes Social capital / learning / relationships	Articulation with other steps/activity
Demax	Sept 13	Assess of suitability of sustainability of the Eco instr	MMU team		Indicators of suitability of 4 instruments based on the score		For each options we must look whether requires instrument
Local level feedback	August 2013 – October 2013	Through games => comment on feasibility of strategy	Communities		Waiting for outcomes	Waiting for outcomes	
Documentation of the process	To be done						

Lessons learnt by the organizers about the overall process ? What went right ?What went wrong ?Suggestion ?

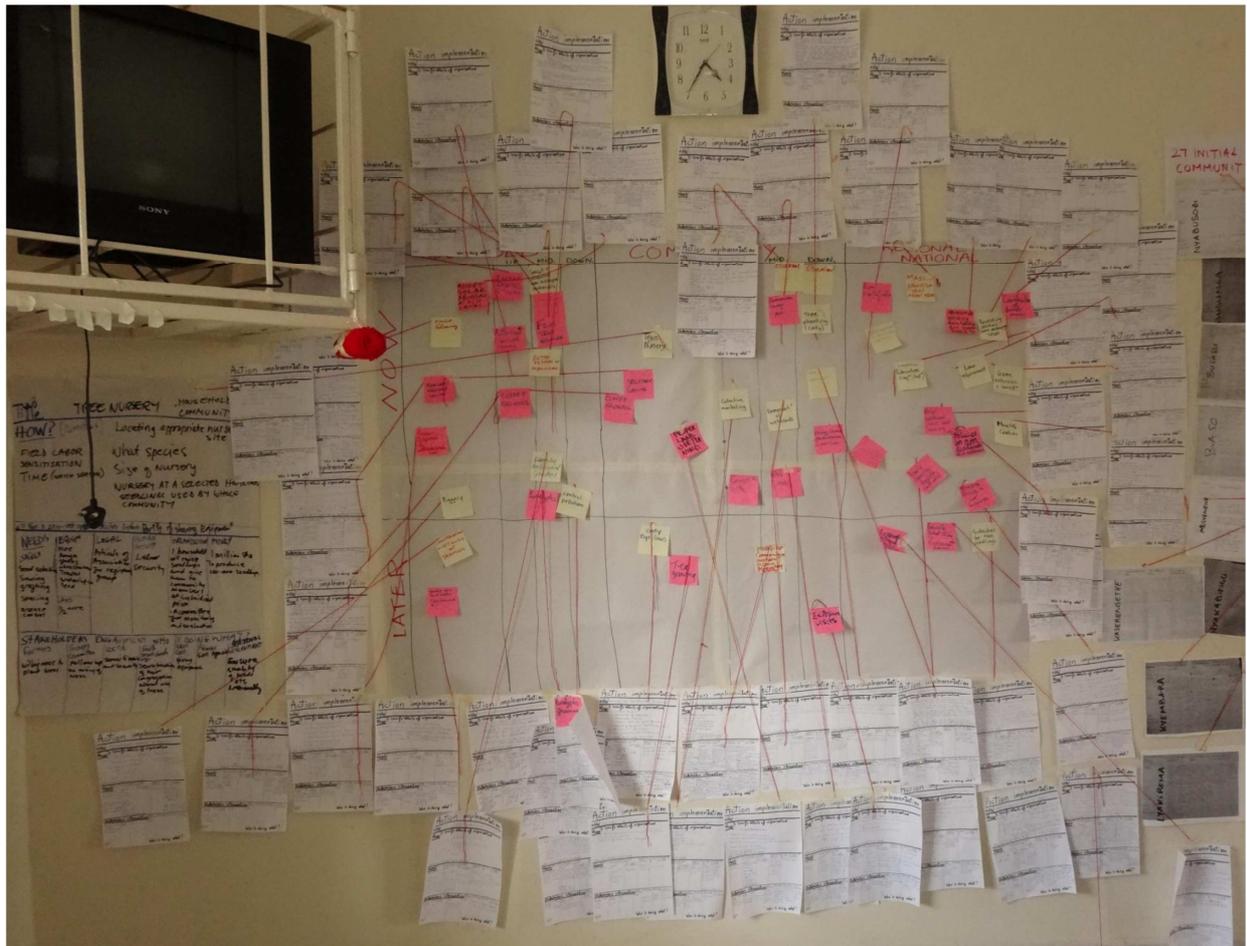
- Mobilization of people at the national level is very difficult even if we do adequate follow up.
- We manage to have only one person for national level. We were hoping to have of parliament members of the region but only one participated. Actually he was a key person for environment (chair person of natural resources committee) so we could communicate and present the work. There is no feedback yet.
- Mpangame proved to be very good mobilizing tool, very popular. In the region is synonymous of AfM. As a game it is an exiting inspiring and mobilizing tools, it is fun but in the same time make participants reflect on issues and INRM. Besides it is tailored to be used without computers.
- We had a mid term evaluation of the project which underlined that districts would have been better be engaged if we used chief administrative officer which are technical person and the one able to get resolution passed through district council. We needed not only to target the political head (the one with the mandate) but also this technical level able to make this works and implementation .
- We must acknowledge that the Whole process of INRM is complex
- WP7 analysis : two different arenas were mobilized (more political broadly based/ the other more local - technical). It was effective a good strategy to connect with large range of differentsth, bring everybody on board.

Description of the approach to select options

Types of options	Method of selection used and specification used	Basis of specification (especially if was adapted in your CS)	Expert input in definition and selection	STH input in definition and selection	What debate the selection or specification did generate which you think important to mention ?what problem issues ?
Economic instrument (other process)	DST	Project defined (DST)	Presentation of the list of the different description (conceptually based) MMU ran the DeMax	Actor run DST, commented on the tools and also DMAX (we had trial with actors but could not process it completely so at the end only MMU team completed Dmax process)	Because we run DST within game wsh, actors compared DST and game and thought that DST was much more for higher level target (national level)
General actions		(territorial target/time frame, resources) the impact were not discussed or specified only implied	Provided the format , guiding selection Robyn send information about content (diversity, technical possibilities)	Format were Filled it by stk They also selected them [RD two step process wsh + game outputs => remerged]	Some options were not clearly defined, (e.g.planting tree: what kind of trre), not very well specified (waste management intervention), were lacking of specification We saw that people know what they want, have their onw view on what can be done

Innovation : did the process help emergence of innovation (for example innovative option compared to options already tested and promoted or the way options were being used, or the way people link them to other dimensions, or what they did consider in the option)

Participants inter-connected the different option, were talking and viewing the options in connection with others, where emphasizing their connection and articulation as shown in the image below:



“Building and evaluation of the strategies” (a set of options of different categories)

Has the building of the strategy lead to any discussion or debate or differences between types of actors?

The most important debate dealt with implementation : how we would work in term of implementation of this options, who / what sth should get things moving? For ex local gov has the mandate but not the resources or the mobilizing capacity while NGO do not have the local mandate; Even if sth are willing, who do implement, who is driving forces ?

We also saw that the contribution of meso scale actors were not fundamentally different from inputs from local level actors,

What were the main issues faced when building the strategies?

We built it in excel sheet and it was very complex to communicate it to all stakeholders. It is necessary to package the strategy in a way which is understandable and easy to communicate by providing a strategy narrative.

In term of defining the main component (time space) resources=> how to find financial resources for funding some of the identified interventions which require financial support.

Combining different assessment/evaluation approaches of the strategies

Evaluation approach used (from different WP)	Main characteristic of the approach	Main outcomes / results	Were the outcome results presented to meso scale actors and how ?
Not done	N/A	N/A	N/A

Were there any attempts to articulate/coordinate the results of the assessment with other methods or provide a synthesis ?if so how ?

Narrative for the strategy

[Tell us what strategy(s) your approach reach ?How would you “describe”, “tell” the strategy ?what is important in your strategy]

Discussion on the narrative building: Our idea is to start by describing the process insisting on involvement of sth and the roles they played, their involvement and commitments to implement actions, Then mention the components of the strategy : back building the strategy medium ... how to you connect action in long term with the actions on short term. Also it would be good to have even a short input on implementation ?

The idea is to do a short leaflet

What are the perspectives the follow up and implementation of the strategy?

we have to follow up to see wheter it impact and do better (follow up)

Suggestion concerning WP7 activities and work: any suggestions/comments regarding AfM WP7 activities and work ?

Arrangements for an important regional meeting for the Rwenzori Region Development Framework which will adopt the INRM strategy developed by the Uganda CS are in advanced stages. The meeting will involve key stakeholders and actors in INRM. It will take place in the last week of April 2014.

Commitments of actors and perspectives

Actors with whom commitment were reached	What did they commit to?	Specific approach used to get this commitments	Is there any specific activity that you think worth mentioning about being essential for that commitments ?
District council leaders and 1 member of parliament	They committed to promote the use of Mpan'game in sensitizing their communities	Were given the opportunity to play Mpan'game with other stakeholders.	The FortPortal municipality member of parliament organized a retreat of all leaders in Fortportal municipality and introduced to them Mpan'game. Participants committed themselves to the use of renewable energy such as charcoal bricks, and suggested the shifting of the polluting abattoir to another place farther away from river Mpanga
Community Based Organisations such as Kabarole Bee-Keepers Association (KBA), Sustainable Agricultural Trainers'Network (SATNET) and over 30 Farmer Field Schools (FFS) from all over te Rwenzori region	Develop an apiculture training centre within the upstream area of river Mpanga in order to promote bee keeping in the region, Mobilize SATNET's member organizations using Mpan'game	Members and leaders of the organization attended some of the workshops and game sessions conducted; FFSs played many sessions of the Mpan'game.	Over 15 acres of land have already been bought in the area close to the source of river Mpanga. MMU GIS team was requested to do the mapping of the area for proper land-use planning. Most importantly INRM strategies at community and regional levels have been made. Some communities have begun implementing options that can be done in the short term and which do not require external support.
Non Government Organizations (NGOs) e.g. Tooro Botanical Gardens (TBG), Sustainable Agriculture Network	Raise environmentally friendly tree seedlings, Train small holder farmers in sustainable Agriculture		
Natural Resources Conservation experts and enthusiasts	Ensure that multi-stakeholder participatory planning using role play games is promoted and sustained	Training some in participatory modeling of role play games and through attending workshops and conferences	Mpan'Game Club for INRM was formed in January 2014. An active office is operational full time. Membership to the club is already 256 and growing steadily.

[Also no discussed specifically there is contributions in previous part of the document

