

**Building resilience through dynamic institutional efficiency
The case of forest biodiversity**

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Abstract

This paper addresses the challenge of building resilience in coupled social-ecological systems through the lens of institutional analysis. We argue that anticipation and reflexivity are important factors in the building of resilience in managed biophysical systems, in particular through their contribution to the dynamic efficiency of institutions. For our analysis, we focus on a specific case study which is the recent experiment with joint forest management institutions in Flanders. We have chosen this case because of its double focus : (1) on forest ecosystems services – and hence on the interdependence of the social and ecological systems – and (2) on reflexive process in the design of the governance mechanisms. We analyze the influence of reflexive processes on two important aspects of dynamic efficiency : the building of learning capacity and the enforcement of new norms of cooperation, by addressing the following questions : What are the new beliefs and norms of cooperation that are anticipated in the dynamics of institutional change ? How does institutional experimentation enhance the variability in the belief systems and the cooperative networks ? What are the governance mechanisms that determine the adaptive capacity of the management institutions ?

Keywords : resilience, reflexive governance, joint forest management, biodiversity conservation

Introduction

Many human societies have exchanged external (environmental) for internal (social) complexity (Young *et al.*, 2006, pp. 306-307). They have homogenized parts of their environment in order to bring their dynamics under control. This is especially clear in the case of managed biophysical systems, such as agro-environmental landscapes or landscapes composed of parks and forest patches in urban areas. Over the last 10.000 years, the survival of social-ecological systems has therefore become increasingly dependent on the resilience of their social dynamics in contrast to their purely biophysical dynamics.

Resilience can be defined broadly speaking as “the capacity of a system to absorb and utilize or even benefit from perturbations and changes that attain it, and so to persist without a qualitative change in the system’s structure” (Holling, 1973). As argued by Young *et al.*, this concept is different from the related concepts of adaptation and adaptability. While the latter refer to actual or future processes of structural change in response to external circumstances, the concept of resilience rather focuses on the internal dynamics that maintains the systems integrity. Hence, resilience addresses the problem of the “why and the how” of structural change and focuses on the interactive nature of a system and its dynamic social and ecological environment.

Resilience in social systems differs from resilience in biophysical systems (Young, p. 312). An important difference is the capacity of learning of social systems, including learning based on anticipation (models) and reflexivity (critical awareness of the conditions and limitations of the learning process). Anticipation *per se* is not enough to enhance the resilience of the social systems. When theories in use (based on technical modernisation for instance) lead to adaptations that are ill-matched to the scale of the disturbances, things can get worse rather than better – witness the debate about climate and biodiversity policy. Resilience of social systems will require reflexive learning process that are able to cope with the mismatches, discontinuities, nonlinearities and thresholds that are likely to be revealed as the process of substitution of biophysical by social systems unfolds.

This paper will address this challenge through the lens of institutional analysis. A lot of work on institutions has focused on the design of well-adapted systems of rules, which best fit to the biophysical and social environment. Here the *rationale* is to look for the optimal institutional design given a certain transaction situation. However, there is also another important aspect of institutional analysis, which focuses on what has been called dynamic efficiency (Dedeurwaerdere, 2006). Dynamic efficiency focuses on the creation of incentives for permanent adaptation and innovation through processes of social learning and normative change. It is this second aspect, focusing on the drivers of institutional change, which is of interest for the study of resilience of social systems.

Using institutional analysis, to disentangle the different variables that play a role in the resilience of coupled social-ecological systems, will remain a fancy exercise if it cannot be tested and put into practice through the building of empirical models. The case of managed biophysical systems seems an appropriate test field for analyzing the contribution of dynamic efficiency to resilience. In these systems, the evolution and maintenance of the ecosystems services is determined both by the dynamics of the biophysical system and the dynamics of the social system of institutional rules and cooperative actor networks. To analyse dynamic efficiency in these systems, we will focus on a specific case study which is the recent experiment with joint forest management in Flanders and examine the influence of reflexive

governance on two important drivers of institutional change : social learning and normative change.

In the first part of the paper, we analyse how forest management institutions have been able to adapt to the specific constraints of human-ecological landscapes composed of small or fragmented forests. First we analyse the collective action problems that have to be solved for maintaining the diversity of forest related ecological services in these landscapes (section 1.1.). Second, we show that the transaction cost characteristics of the joint forest management (JFM) institutions make it a good candidate for addressing these collective action problems and hence to fill the institutional gap in the forest regime (section 1.2.). In the second part, we address the issue of enforcing the adaptive capacities of the forest management organisations by focusing on the case study of joint forest management in Flanders. We show how the success of the joint management organisations is related to their capacity to build new beliefs and forms of cooperation around the concept of sustainable management. First we analyse the governance mechanisms that played a role in organising the process of change in beliefs (sections 2.1. and 2.2.). Second, we'll focus on the dynamics of the change in the norms of cooperation (section 2.3. and 2.4.).

1. Filling the gap in the forest management regime : joint forest management in Europe.

Joint forest management (JFM) institutions are groups of small-scale forest owners, which gather in a collective management organisation. The key feature is that membership is based on a geographical criterion, which is the belonging to a relevant ecological region with common problems, often characterized by scattered forest patches, and not on the status of the ownership, which can be both public and private. For example, one will find in the JFM organisation the different forest owners of a set of scattered rural towns, from the small private forest owner and farmer, through the representatives of the local sports club and the church council owning small forest areas, to the park manager appointed by the town council and the local public servant managing forests areas adjacent to public property.

JFM institutions are rather the exception than the general rule in forest management. The main tools for sustainable forest management are the system of protected areas (under public ownership or in conservation concessions) and market tools such as forest certification in the cases of private ownership and private management of public forests. However, both the nature reserve policy and the economic incentives remain limited in scope. These tools are effective in the case of well-identified actors who control the use of the resources in a cost-effective manner (such as in the case of few large forest owners of a certain area), but face important difficulties in the management of patches of small and fragmented forests with a heterogeneous set of owners. Hence, in the case of fragmented forest ownership, joint forest management seems to be a possible solution to fill some of the gaps in the forest management regime (cf. table 1).

In Europe, forests have been virtually all altered by man to some extent, with the exception of the boreal zone on the European side of the Russian Federation and some scattered relics in mountainous areas of the Balkan, Alpine and Carpathian regions (Frank, p. 378). Moreover, the majority of forest owners own small or fragmented forest and hence this is an important target group for any forest policy in Europe. This typical patchwork of forests has some peculiar characteristics such as low commercial value of the wood, diverse collective preferences and levels of understanding of sustainability and high transaction costs in the monitoring of the management practices of the different actors. In these areas, the JFM

institutions aim to be a collective service provider at an intermediary level of social interaction, where the different players can compromise and build agreement on common objectives through collective learning and collectively manage services such as selling of wood and ecological management in a cost-effective manner. Moreover, and that is precisely the idea we would like to examine in this research, these institutions have been able to generate new social possibilities by creating normative change and generating new beliefs amongst individual actors and social groups, which are not represented in the dominant institutional forms of nature protection. In this section, we will first analyse the collective action problems generated by the specific ecological and management characteristics of these landscapes. In the next section, we will then turn to the contribution of JFM organisations in the building of cost-effective institutions for solving these collective action problems.

Types of forest management institutions with an important nature protection objective	Size of forests	Cost-effectiveness	Scope	Legitimacy
Strict forest reserves and forest national parks (IUCN categories I and II)	Medium to large forests	High : investment with direct benefits to nature protection	Limited (only 0,7 % of the European forest area) ¹	Upper medium to High (well identified areas, national patrimonium)
Forest Certification	Medium to large forests, private forest owners	High for large forest areas (payment to an independent certification body)	Limited (only around 5 % of the European forest area in PEFC, even much less in FSC)	Weak (PEFC contested because without stringent sustainability objectives, FSC stricter but very marginal)
Joint Forest Management (cooperative service providers)	Fragmented forest ownership, public and private forest owners	Medium : a lot of transaction costs (meetings etc.), but important economies of scale (e.g. in knowledge gathering)	Exists in most European countries for small forest owners, however few also develop services for nature protection. In Flanders, they represent 10% of the forest area.	High (recognized neutrality, because of mixed public private membership)

Table 1. Comparison of typical public and private forest management institutions with an important nature protection objective (source of the data in the table : Frank, 2005 ; Gulbrandsen, 2004 ; De Maeyer and Seynaeve, 2005 ; Van Gossum and De Maeyer, 2006).

¹ In Europe, strict forest reserves (managed mainly for biodiversity purposes) only represent 6% of the total forest area (3,2 % forest reserves (IUCN category I) and 2,8 % national parks (IUCN category II)), 2003 count (Frank, 2005 : 379-380).

1.1. The case of JFM : description of the transaction situation and main incentive problems

Socio-economic research in the last decade has shown that a strict focus on the species diversity concept, and the related policy of strict nature reserves, is not appropriate for the management of the important parts of biodiversity that are situated outside the nature reserves, where a more human-centred concept of biodiversity is needed. The research on ecosystems services precisely has developed such an alternative concept, but the translation of this concept to the context of institutions that govern the decision making on environmental management is still far from complete.

From an ecological point of view, small and fragmented forests play an important role in the provision of different ecosystems services on which forest health, broader nature protection and sustainable use of forest resources depend. Important services such as watershed protection or pollination control are provided in functional diverse landscapes composed of a mosaic of forest patches and other land uses. The relevant criteria for the ecological health of these landscapes is not so much the diversity of tree species as the maintenance of functional diversity in the landscape, of which the contribution to global species diversity is only one component (Hassan *et al.*, p. 29 ; Perrings and Touza-Montero, p. 16). Different types of ecosystem services can be distinguished in small and fragmented forest landscapes, including regulating and supporting services, provisioning services, cultural services and forest biodiversity² :

- Regulation services (regulation of ecosystems processes providing human material benefits) : water purification, air quality maintenance through the retention or detoxification of pollution, erosion control, climate regulation through carbon storage and microclimatic stabilisation ;
- Supporting services (regulation of ecosystems processes providing benefits to other ecosystems) : soil formation, feeding habitat, nutrient recycling, ground cover for key watersheds
- Production services (products obtained from the forest) : timber, wild living resources, medicinal plants ;
- Cultural services (human non-material benefits from the forest) : recreation, aesthetic, educational and scientific information ;
- Forest biodiversity (contribution to the diversity of the global and local gene stock) : tree diversity, forest plant diversity and forest wildlife diversity.

These ecological characteristics and the correlative constraints on the management of the small and fragmented forest landscapes generate a set of collective action problems that will have to be addressed by the governance mechanism. Two sets of the collective action problems are especially important for our purpose, which are the problems generated by the public good character of biodiversity conservation and by spatial externalities.

First, forest biodiversity and the related ecosystems services have public good properties as many services are non-exclusive in use (cf. table 2). Some services, such as the regulation services and cultural services, have pure public good properties. Forest owners will be inclined to free-ride on the efforts of others, but the consumption of the derived products, such

² We include forest biodiversity as a distinct ecological service, because, tree species and forest plant diversity as such only plays a major role in some, but not all the ecosystems services (Hassan R. *et al.*, p. 300).

as clean air or a beautiful forest landscape does not lead to the depletion of the forest resources. The main incentive to contribute to the provision of these public goods are the ecological benefits they provide to the owners' forest. However, inappropriate use, such as by hikers or hunters, can lead to a decrease in the quality of the provided service. Other services, such as waste assimilation through detoxification, water provision or the provision of biochemical resources through nutrient recycling have common pool resource characteristics : they are non-exclusive in use (or the costs of exclusion are very high), but over consumption will end up by destroying the resource base. The maintenance of these services will depend on cost-effective means for coordinating amongst forest owners and monitoring the depletion of the common gene stock. Finally, the provision of biodiversity itself by the forest also has common pool resource characteristics, but with one important peculiarity which characterizes the incentive problem : both overexploitation and under exploitation can deplete the forest biodiversity. Indeed, in the case of managed forests, a regular thinning of the forests is an important factor in enhancing both the tree, plant and the forest wildlife diversity. One of the consequences of the enforcement of the forest regulations in the mid-eighties has been the withdrawal by the small forest owners of any forest management, including thinning, due to the high transaction costs of the new system of felling permits. This has led to a decay in the ecological quality of the forests and was one of the reasons for initiating the JFM initiative in Flanders.

Public goods and services provided by small-scale forests	Forest biodiversity (diversity of patches, tree diversity)	Regulation services (water sanitation, feeding habitat, ...)	Production services (timber, ...)	Information and Carrier functions (support for biotech innovation, recreation facility, ...)
Type of Good	Common Pool Resource	Public good	Private good	Public good
Positive incentives to provide the goods and services	Ecological benefit : enhances the quality of all the forests	Ecological benefit : enhances the quality of all the forests	Economic benefits	Good reputation
Disincentives for providing the goods and services	Transaction costs of coordinating with other forest owners High transaction costs for felling permits (underexploitation also leading to diversity decline) Economic benefits from monocultures	Free riding on the other forest owners : leading to under-provision	High transaction costs for felling permits No efficient market for small forest products	Pollution of the carriers by inappropriate use

Table 2. Provision of forest related eco-services in the case of small and fragmented forest landscapes

Second, the sustainable management of small and fragmented forests has to deal with spatial externalities. Indeed, the relative importance of genetic, species and ecosystems diversity

tends to be rather different at the local level than at the global level (Perrings and Touza-Montero, p. 16). At the global level the primary concern is with the protection of the global gene pool. At the local level, the primary concern is with the interaction between species and ecosystem types in the provision of ecosystems services.

At the local level, forest ecosystems services are sustained by a dynamic balance between diverse species composition (for their contribution to different ecosystems services) and different age-classes (for obtaining an appropriate temporal distribution of the provision of these services). Management decisions both on the level of a forest stand and on the level of the landscape play a role in maintaining this dynamic balance (cf. figure 1.). On the stand level, biodiversity conservation should focus on enriching the forest structure, through the presence of large trees, snags and woody debris (Hansen et al. 1991). On the landscape level the ecosystems services should be considered over a larger area and biodiversity conservation should involve having a spatial arrangement of forest patches in different successional stages, including different species and different ages. From the point of view of the landscape, the spatial arrangement can include both even aged and low diverse structures and multi-aged and diverse ones, as long as the overall diversity is sufficient to maintain the functional diversity of the ecosystems services. In forests that are managed by multiple users/owners these spatial interactions on the landscape level give rise to spatial externalities. For example if neighbouring stands are owned by different forest owners, they should not clear-cut all the stands at the same time, but coordinate over time to maintain the overall ecosystems services of the whole landscape (Perrings and Touza-Montero, p. 19-20). These spatial externalities, due to ecological interactions between landscape components, imply the interdependence between different forest users and managers (Perrings and Touza-Montero, 2004, p. 16).

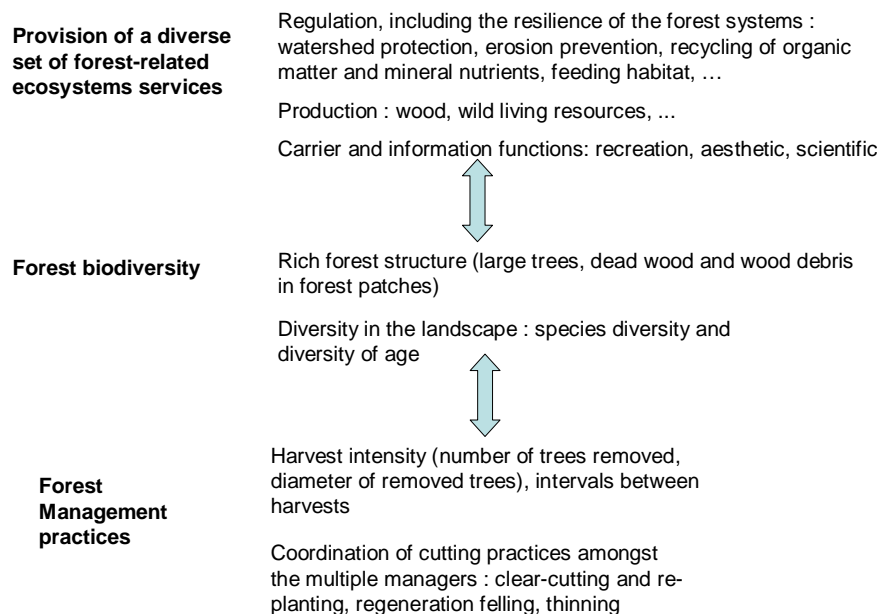


figure 1. Relationship between management practices, forest biodiversity and ecosystems services (figure by the author)

1.2. The contribution of JFM to the building of cost-effective management institutions

The spatial externalities of forest biodiversity and the public good character of the forest related ecosystems services have been used as arguments for public intervention in forest management. This has resulted in the programs for buying back high nature valued land by the state, compensation payments to private owners and enforcement of state regulation. However, in the case of a mosaic of small and fragmented forest patches, these policies are costly to implement, in particular because you have to regulate both underexploitation – thinning the forests enhances the plant diversity – and overexploitation. This is one of the reasons why in the mid-nineties some governments switched from ineffective command and control regulation to decentralized forest policies based on the regulation of joint forest management initiatives.

From an institutional economics point of view, what is important in solving the collective action problems in a cost-effective way is the design of rules of decision making and rule enforcement which can reduce the transaction costs. JFM organisations in Flanders and elsewhere in Europe clearly have contributed to more cost-effective management of small scattered forests. That's why we introduce the case of JFM in Flanders, by first briefly analyzing its role in economizing on the transaction costs. In the next section, we will then turn to the analysis of the contribution of the JFM organisations in Flanders to building social-ecological resilience in scattered forest landscapes.

In the case of Flanders, JFM has lead to quite impressive outcomes in a relatively short period. The overall region which is covered by the JFM organisations recognized in 2006 is an estimated 100.000 ha which amounts for 75% of the forest cover in Flanders (cf. annex 3). Each of the JFM organisations (called “bosgroepen”) focuses on sub-area's within these regions, where forest degradation is progressing most rapidly or where dispersed ownership is highest. It is not dealing with big public forests or, in principle, with private forests above 5ha³.

The main decision making body of the JFM is the general assembly of forest owners, assisted by a JFM coordinator and one administrative staff. All decisions on forest management, felling and negotiations with user organisations are taken by the general assembly, on the basis “one man, one vote”, independently of the forest surface of the owner. The JFMs also strive to a balanced membership amongst small public and private forest owners, requiring a majority of private forest owners in the general assembly.

A well-established JFM is the bosgroep Zuiderkempen, which operates in a landscape containing about 8000 ha of forest. Within this landscape a priority working area of 1134 ha of highly scattered forests has been selected for building cooperative forest services in the period 2003-2006. In the management plan for 2007-2010 another 801 ha is planned to be added to this working area. In the working area meetings with forest owners are organised, membership to the JFM organisation proposed and forest management plans discussed. As a result of this process, in total 513 ha private forest has been integrated in detailed common forest management plans (45 % of the working area), involving a total of 462 different small private forest owners (an estimated 30% of the total number of owners in the working area). Moreover, through the negotiation of access plans between the JFM organisation, user

³ Managers of forests above 5 ha can be members of the JFM, because of the importance of developing a coherent approach for the whole area. However, the management activities itself have to be targeted in priority to the needs of the small forest owners (mostly between 0,5 and 1,5 ha).

representatives and the local authorities, a total area of 342 ha private forest has been opened up to different user groups (30 % of the working area). If similar results could be accomplished in the other JFM's in Flanders, then an expected total area of 5909 ha could be opened up for walking and recreation in the nearby future, which is more than the total area of the largest remaining public forest in Flanders.

From the point of view of the building of cost-effective institutions, the main benefit of the JFM institution is its contribution to lowering the transaction costs of the forest owners in their negotiation with the administration, the other owners and user groups. First, felling of trees in private forests requires obtaining a permit, which is quite burdensome for small owners. The joint management plans established by the JFM organisation allow to ask one common permit for a whole set of private owners in a cost-effective way. Hence, the JFM is in the first place a way to go beyond the ineffective command and control regulation for felling permits that has been put in place in the mid 1980ies and which has led to the neglect of the forest by the small private forest owners, instead of leading to more sustainable forestry. Second, JFM facilitates the negotiation of forest access plans with the different use groups and the local administration through organising collective dialogue. The resulting clarification of access and use rights is a win-win situation both for the owners and the users, because it saves them numerous case by case discussions on the access and use rights in each individual forest patch.

The success of the negotiation both on the joint management plans and the access rules is not immediate (De Maeyer and Seynaeve, 2005). At the outset, most forest owners are suspicious of giving away any management rights to the JFM organisation, because they fear that it will lead to increased government intervention. The success in involving forest owners in sustainable management depends on the respect of the autonomy of the forest owner, on a slow and gradual process of confidence building, and the effective involvement of the forest owners into the collective management institution. It is to the analysis of these features that we turn in the next section.

2. The contribution of JFM from the point of view of dynamic efficiency

Analysing decentralized forest management through JFM from an institutional economics point of view only reveals one part of its role in the forest management regime. Indeed, there is also another important aspect of institutional analysis, which focuses on the creation of incentives for permanent adaptation and innovation through processes of social learning and normative change. In this second section, we analyze the influence of reflexive processes on two important aspects of dynamic efficiency : the building of learning capacity and the enforcement of new norms of cooperation.

In this paper, we argue that anticipation and reflexivity is an important attribute of the dynamic efficiency of the institutions and hence of the resilience of the coupled social-ecological system. Through anticipation social systems have considerably increased their capacity to adapt to changing environments and to maintain their functional integrity when confronted to external shocks. However, there is a flip side to this "forward looking" and "projective" behaviour. Indeed, in cases of important mismatches between the anticipation and the behaviour of the ecological or social environment, it may instead increase the vulnerability of the system. This feature is at the forefront of the debate on biodiversity and climate change, where both the framing of the debate in terms of probabilities and risk management and the social rules of collective decision making in a classic nation-state

context have proven to be inadequate. The continuing resilience of the social system will hence also depend on the critical awareness of the limitations of any operation of anticipation.

In the case of coupled ecological and social systems, negative outcomes of behaviour can be due to insufficiencies in the anticipation of the effects of the social rules or an inadequate representation of the functioning of the ecological systems. Hence resilience will depend on a critical awareness of the insufficiencies both of the normative anticipation of the effects of the social rules and the factual anticipation of the functional models. Moreover, the coupled social and ecological systems are often difficult to disentangle. Perceived mismatches on the level of the models could hide mismatches on the level of the social rules, and vice-versa. Finally, in the case of strong non-linearities, different local optima are possible and there is no point of view outside the coupled dynamics to judge what socio-ecological configuration is the best adapted. In the latter case, the observation of “mismatches” will not show a clear-cut advantage of one configuration over another. In such situations of intrinsic bounded rationality, the awareness of the intrinsic incompleteness of any operation of anticipation is also an important driver for institutional experimentation with different alternative configurations.

This reflexive anticipation of mis-matches, interdependencies, non-linearities and intrinsic incompleteness contributes to generating variability in the system of rules, which has been recognized as an important characteristic of resilience. It is on this relationship between reflexive anticipation and variability that we propose to focus our analysis of the dynamics of institutional change in JFM.

In the case of Flanders, social learning on the framing of sustainable forest management and its implication for adapting the existing forms of social cooperation has been at the heart of the JFM organisations from the very beginning. In 1994 a pilot project started which received early recognition as an instance where new ways of dealing with forest management could be experimented. It's only after the experiment had gained some momentum that the forest policy law was changed, based on the lessons that were learned from this project. A flexible legal framework was designed that, while setting 12 targets to be reached by sustainable forestry, allowed further learning in the pilot JFM organisations. This sequence of experimentation and change in the policy framework has been re-iterated in the subsequent development of the forest groups. Throughout this process, a clear division of tasks was established : the control function of compliance with government regulation remained with the executive bodies such as the forest administration, the forest rangers and the local authorities, while the social learning was the task of the JFM management institution⁴.

We will analyze the contribution of JFM to the social learning process from the double point of view of the change in the framing of the sustainability debate and the change in the norms of cooperation between the different stakeholders involved in the provision of the forest ecosystems services. First, we will analyze the change in beliefs related to key concepts such as biodiversity and sustainable yield, both on the side of the forest owners and the decision makers. Second, will analyze the role of JFM in increasing the norms of cooperation amongst the forest owners and between the forest owners and the user groups. In both these cases, we will focus on the role of anticipation and reflexivity in the experimentation with new social

⁴ This is in sharp contrast with the approach in France and the Netherlands, where the learning was organised through the national forestry institutions and where the indicator and standard setting activities in the JFM organisations remained restricted to the adoption of a weak set of common guidelines such as the PEFC or the ISO91001 certificate.

possibilities. What are the new beliefs and forms of cooperation that are anticipated in the dynamics of institutional change ? How does experimentation lead to enhance the variability in the context specific beliefs systems and cooperative networks ? How does this variability feeds back to the political environment defining the legal rules and standards for the operation of the JFM organisations ? What are the governance mechanisms that determine the adaptive capacity of the management institutions ?

2.1. The dynamics of change in the cognitive frames

The first aspect of social learning in JFM is its capacity to open up new social possibilities through changing the background beliefs that influence the forest owners' decision making process. Decreasing transaction costs are an important criterion of success, but this does not necessary lead to a more sustainable forest policy, nor to an agreement on what is the meaning of such a policy.

In the case of JFM it is clear that conflicts over beliefs on biodiversity conservation in different institutional setting are an important barrier to enhance the provision of ecosystems services by private forest owners. As discussed in the previous section, socio-economic research in the last decade has shown that the species diversity concept on its own, and the related policy of strict nature reserves, is not sufficient for the conservation of biodiversity in managed biophysical systems. For the traditional nature association, this implies a change in beliefs, from a nature centred conception of biodiversity to a human-centred conception, based on the maintenance of the functional diversity in ecosystems services. For the forest owners, moving towards the human-centred conception, also means an evolution in his perception of the stakes behind the biodiversity debate. We have indicated some of the main components of these two conceptions in table 3.

Other nature associations	JFM
Nature is central	Multifunctionality / human being is central
Tough approach (recourse to expropriation)	Soft approach (respect for ownership)
Short term tangible results needed	Long term gradual process
Work of experts	Involvement of all stakeholders
Focus on surface of nature reserves	Focus on building support

Table 3. Comparison of the core beliefs of the JFM approach to other nature associations in Flanders (Bosgroepen, 2005, section 2.2.2.).

A typical conflict around these two beliefs can illustrate the importance of the change in the cognitive frames for moving towards sustainable management. In the “bosgroep Zuiderkempen” a private forest owner of 60 ha valuable forest was in conflict with the adjacent wetland nature reserve on issues related to management practice and access rules : visitors to the nature reserve use paths that are in his forest without his permission. Moreover the nature park managers also would like to use the private forest to do species observations in the neighbourhood of the wetland. However, the private forest owner considers any concession to the nature reserve people as being a road to restriction to his management rights. He clearly stated his intention to sue the Flemish government before the State Council (Raad van Staten) if it intended to put in place such restrictions. The private forest owner is a member of the JFM organisation. Activities organised by the JFM organisation have initiated a dialogue between the private forest owner and the nature reserve people. Through this dialogue, it appeared that the aim of the nature reserve managers is not to restrict forest

activities, but to better understand the role of the ecosystems around the nature reserve that function as a host for the species also observed in the nature reserve. A better understanding of the harm and the benefits to the private forest by the presence of these species – and the visitors that come with it – is clearly also in the interest of the private forest owner. It is finally on the basis of this new representation of the problem at hand, which is the presence of an ecological buffer zone with both economic value and ecological functions, that the private forest owner changed his perception of the nature reserve people. In a next stage, common problems related to the buffer zone were identified and solutions elaborated.

The critical element in this process is the change in beliefs. The transaction economics approach suggests opportunities for mutual gains generated by the adoption of a joint management approach. However, both the selection of problems that are relevant to be discussed in the JFM organisation and the perception of the gains to be made by the different players depend on their understanding of the situation at hand. The adoption of the principle of the human-centred approach by the JFM organisation is clearly an important, but not sufficient step in this process. The translation of this principle to a change in understanding of the concrete situation requires a learning process by the different players involved in different action settings. What is missing is the identification of the specific impact of the management practices on the provision of ecosystems goods and services.

The recognition of the role of the dynamics of beliefs in building a context for the solving of collective action problems is also an important characteristic of other JFM organisations such as in the Finnish case (Nuutinen, 2006). There, the focus is also on creating mutual gains between forest owners and nature advocacy by providing systematic and quantified comparative information on the possible gains that can be made by choosing for sustainable management practices. It is expected that the involvement of forest owners in the social learning on the costs and benefits will lead to a gradual change in their perceptions. As we have seen, this latter question is also crucial in the situation of conflicting beliefs on sustainability which prevails in the densely populated area of Flanders.

2.2. Evaluating the progress of the learning process on the cognitive frames

The use of indicators by the JFM organisation provides a useful yardstick to measure the progress of the learning process. Indeed, we can compare these indicators, which are the result of a collective learning process within the organisation to the set of formal targets in the legislation on “criteria for sustainable forest management” (CSFM). The formal targets, which came out of the PanEuropean forestry process and have been adopted by the Flemish government, are compulsory – wherever relevant – for all private forests > 5ha, for all public forests and for all forests in the Flemish ecological network. Their adoption is voluntary for the private forests < 5ha, but they are considered to be the official reference standards to be used by the JFM organisations. In practice, however, both for the public and private forests compliance with the CSFM criteria is still extremely weak (Research Institute for Nature and Forests, 2006, p. 30).

The “gap” that we can measure between the legal standards (the CSFM criteria) and the indicators is not a gap between “expert based” preferences – as revealed in the legal standards – and so-called “subjective” preferences of the individual forest owner. The latter, measured for instance through field surveys, are only a poor indicator of the behaviour of the forest owners involved in the collective management organisation. Indeed, the individual preferences are transformed through the learning process in the collective management

organisation and the resulting common indicators reflect the resulting collective preferences of individuals as members of a collective organisation. The gap we measure hence is a gap between beliefs expressed in the government targets and the translation of these beliefs to agreed standards by the stakeholders involved in the local collective management organisation.

JFM has been conceived by its initiators as a gradual process where (1) management objectives are confronted to the perceptions of opportunities by forest owners and where (2) the generated information is used to adapt the operational objectives of the JFM organisation. The JFM organisation receives support by the government, as long as the operational objectives, formulated through a clear set of indicators, are met and if the indicators show a progress in moving towards the government targets. It is this basic constraints that forced the JFM organisation in a process of evaluation of the limits of the use of the government targets. This has lead both to an awareness of the limits of its own representation of sustainability as revealed by the confrontation with the broader normative standards of the CSFM criteria, and a better understanding by the policy makers of the limits of their system of CSFM criteria as a general policy tool that aims to cover both small and large forest owners.

The CSFM are a clear expression of what the concept of multifunctional forest management would look like in the ideal case. It defines clear targets organized around 6 main sets of criteria of sustainable forestry. Each set of criteria is measured through a set of legally specified indicators, leading in total to a set of 24 criteria and 52 indicators :

1. Criteria for the implementation of the existing legislation
2. Criteria for the maintaining of the social and cultural functions of the forest
3. Criteria for the maintaining of the economic and productive functions of the forest
4. Criteria for contribution to the protection of the environment
5. Criteria for the contribution to biodiversity conservation
6. Criteria for monitoring and planning of the forest management

To analyse the gap between these sets of legal criteria and the indicators and targets elaborated in the JFM organisation, we can use the available data of the “Bosgroep Zuiderkempen” (BZK), which is considered a reference case by the Flemish government and which is a case where the learning process for the translation of the CSFM criteria has already been going on for a fairly long period (from 1999 to 2006). The subsidies to the JFM by the Flemish government are conditioned by the adoption, at regular periods in time, of a management plan with clear indicators. Once adopted by the JFM organisation, these operational targets have to be implemented within the timeframe of the management plan. The comparison between the legal criteria and indicators and the operational targets results in a matrix of correspondences and gaps. In the following, we will use this matrix to analyze : (a) what has been learned in the JFM organisation (self-evaluation) (b) what are the remaining challenges in the learning process ? We use here the indicators and targets adopted by the General Assembly of BZK for their operational management plan 2007-2012.

The main lessons drawn from this matrix are (for the detailed correspondence matrix, cf. annex 1) :

- (1) Correspondences between CSFM and BZK : mainly within the criteria set 2 (social and cultural functions) and 6 (monitoring and planning) ; some indicators of criteria set 3 (economic functions) and 5 (forest diversity)

(2) Gaps between CSFM and BZK : no clear reference in BZK to criteria set 4 (environmental services) and very few to criteria set 5 (forest diversity)

The main sustainability indicators and targets that have been adopted by the forest owners organisation concern the social and cultural functions of the forests and the protection of habitat (forest borders and heath landscapes). A clear target of 690ha forest area with selective access of the population to the forest (35 % of the extended working area)⁵ and an information and reporting system of the local population's wishes has been put into place (target audience 350/year). Forest management measures for fragile or biodiversity rich habitats have been planned with the use of detailed GIS maps (Geographical Information System), for an area of 150ha/year. Further action for combating invasive species (American bird cherry / *prunus serotina*) will be pursued in the priority working area. These sustainability targets set by the forest owners are the result of awareness building and discussion and negotiation around experimental test cases.

The comparison also reveals some important gaps. For instance, it is interesting to see that tree diversity as such is not taken over as an explicit measure of sustainability by the forest owners. Beyond the habitat protection we mentioned before, most of the indicators within the forest biodiversity category (criteria 5) are not taken into account. Also the indicators for contribution to environmental protection (set of criteria 4) do not appear in the targets of the management plan.

What kind of limitations does this comparison reveal from a reflexive perspective ? First, from the ecological perspective, JFM has clearly shown a gap between the expert build criteria for sustainable forestry and the way that these criteria can be coherently applied in concrete action settings. This gap is shown to be a permanent critical challenge for the JFM organisation. The decentralisation of the decision making power on the real management decisions has allowed to build an effective context for the translation of some of the sustainability indicators. The selling of timber, resulting from the joint management, is of course an important driver for the activities of the forest groups – albeit also with direct impact on more healthy forests, but this is balanced with a concern for other eco-services such as clear targets for access agreements and combating invasive species.

Second, the comparison also shows some of the remaining challenges to be tackled by the forestry group. In particular, the conservation of tree species diversity, beyond the direct social, cultural and economic roles of the forest, remains a difficult issue. A new pilot project will start this year, in order to develop a different methodology for “limited sustainable forest management plans”, which includes a concern for tree diversity. The forest legislation has created a frame for the development of these plans, but, again, very few of these have been implemented. The pilot project will reconsider the basic concepts of these plans with the stakeholders in the field.

In summary, the use of indicators allows both a process of internal self-evaluation around feasible and evolving targets in the collective management organisation and a process of external evaluation by the government, leading to new incentives or adjustment of its policy. The methodology adopted by the JFM institution in Flanders is based on a process of gradual change in understanding by the different stakeholders, from a nature-centred approach of biodiversity to an ecosystem services (and hence human-centred) approach. Three

⁵ extended area : 1134.3 ha + 801 ha (Bosgroepen Zuiderkempen, 2006, p. 32)

components are key to this process as it is described in the vision document of the JFM groups. First, the project starts from the interests and needs of the forest owners, rather than their position and discourse in regards to nature conservation. Second, the JFM group organizes a learning process on the definition of the sustainability targets. Third, the design of the learning process itself is evaluated at regular intervals by the participants to adapt it to the local circumstances and stakes at hand.

2.3. The dynamics of change in social norms

The second aspect of social learning in JFM is its capacity to open up action possibilities through the enforcement of informal social norms of confidence, reputation and reciprocity amongst the different stakeholders. In this section, we will analyze the forms of cooperation with different user groups and types of forest owners that are anticipated by the JFM organisation through the building of these informal norms. Both the contribution to problem solving (i.e. their contribution to alleviating the collective action problems) and their contribution to reflexive anticipation of new forms of cooperation will be the focus of the analysis. Hence we will focus on the way anticipation has lead to successful experimentation with social norms of confidence, reputation and reciprocity and how this experimentation has lead in turn to adaptations in the formal institutional rules of the game which define the functioning of the JFM organisations.

On the average, small-scale private forest owners tend to value nature protection and biodiversity more than large timber oriented forest exploitations, both in the case of public and private forests (cf. references cited in Bruciamacchie, Garcia and Stenger, 2006). Because of the low economic value, non-use values such as aesthetic and nature values are relatively more important to the small forest owner. It should therefore be an ideal test ground of an effective policy of sustainable management. However, the practice has often shown the reverse, and there is no clear indication that governmental regulation receives automatically a better compliance rate amongst small and fragmented forest owners than amongst large forest owners. The reason is a poor understanding of the collective nature of rule change and implementation. Indeed, norms as informal social rules will only be effective if appropriate means of sanction and control are put in to place, such as through mechanisms of ostracism, reputation and reciprocity. Consequently, pro-biodiversity norms will only be put into practice if there are relational networks that can provide such informal mechanisms of verification and sanctioning.

What we are interested in is the building of social cooperation between the different social groups that benefit and contribute to the provision of a local collective good (the provision of the ecosystems services). In this process of social learning, social groups bargain over collective preferences and beliefs that they value the most and make concessions over others. The resulting compromise is both different from what the individual groups expect and beyond the constraints set by the political process, which expresses mainly the “median voters’ interests” and hence does not provide appropriate tools for compromising amongst marginal social groups such as nature protection activists and small forest owners for instance. The real stake here is to measure the scope of the compromise that can be reached at an intermediary level of social organisation, between the different stakeholders involved in the production of the local public good.

The main divisions amongst social groups as revealed by sociological analysis amongst forest owners in Flanders is between active exploitation (owners in involved in use and

management) / active use (owners involved in use, not in management) / passive ownership (ownership only for investment or from heritage) of the forest (Verheyen *et al.*, 2006). The active exploitant is most concerned by his forest and inclined to participate in the forest management plans ; the passive the least. Two other divisions have to be added to these categories that play a role in the sociological analysis of the potential membership of the JFM organisation, which are medium size (above 5 ha) versus small and private versus public. If no social learning would be organised, the JFM would at best represent the active forest exploitant and some public forest owners who own small forests, which would mean a membership rate of around 10 % in the BZK priority areas. The real stake hence is to evaluate how the institutional experimentation and building of confidence in the JFM organisation allows to broaden its scope and to build a compromise with the other social groups of forest owners and users concerned by the services provided by the small forests in its management area⁶.

JFM adopted a gradual approach to the broadening of the social network of cooperation. First, it enforced cooperative norms amongst the forest owners in its own working area. Second, the JFM council has experimented with new institutional relays for these actors that are not taken into account in the actual institutional framework. A typical case is the case of the forest users (naturalists, hikers, hunters, bikers). Nor the local administration (except for some ineffective consultative councils), nor the private owners represent appropriately the interests of these groups. As a result, conflicts remain unsolved, or forests become more and more enclosed for further use and the general interest objectives are not met. The JFM council initiated an ad hoc “trilateral” negotiation process, with all the regional forest owners, the representatives of the user groups and the local administration. The access rules that came out of these discussions were proposed by the owners, negotiated and amended through discussion with the user groups and then accredited by the local administration. This successful experiment will now be used in other JFM councils as well. Finally, through building more general support on “sustainable forestry” with other partners such as large forest owners and public forest managers, social learning has also contributed to make command and control and economic incentive policies more effective, where these are more appropriate.

2.4. Evaluating the progress of the learning process on the social norms

To evaluate the gaps and the progress on the dynamics of normative change, we need standards for evaluation. Two candidates for such an evaluation are the membership rate of the forest group and the involvement of the external user groups (the representation of nature organisations, hikers, hunters, etc.). We will mainly focus on first, because the experimentation with the trilateral negotiation procedures is too recent, to draw yet conclusions on the evolution of the scope of representation. We will again refer to the data available for the forest group “Zuiderkempen” (BZK).

The membership of BZK has increased steadily from 2002 to 2006 with an average of 120 new members a year. This evolution is in line with the gradual extension of the focus area,

⁶ In some cases of ecosystems management, policies for building norms of cooperation in the owners’ and users’ communities are less important, whether because they rely on formal enforcement mechanisms or because they operate in a field where social networks are well established and clearly defined. The latter seems more the case in the functioning of joint forest management in countries such as Sweden or Finland ; or in the Eiffel region in Germany. This clearly does not apply to the patchwork of small private forest owners that are the target of JFM policy.

which in 2006 included 9 priority forest areas with a total surface of 1134 ha, which were selected upon the high dispersion of forest patches in the hands of small forest owners.

What can we learn about the representation of small forest owners in these 9 priority forest areas ? First, within these priority forest areas the percentage of private forest owners that joined the forest group has increased, from 10% in 2002 to 28% in 2006 (on a total of 462 forest owners in this area, cf. Bosgroep Zuiderkempem, 2006, p. 7 and p. 32 ; more details in annex 2). These data are in sharp contrast both to the situation that prevailed before the creation of the JFM organisation, when nearly no private forest owners were managing their forests, due to their difficulties to implement the new forest regulations. Second, if we compare the membership rate in 2006 amongst the 9 forest areas, than one can observe a clear variability depending on the size : the smaller the area, the higher the membership rate (independently of the number of forest owners) ; which confirms the importance of proximity also highlighted in other studies on relational networks. Except for 3 out of the 462 owners, all these owners are small owners with a forest area between 0,5 and 1,5 ha.

The importance of these characteristics clearly appear when comparing the Flemish case to other cases of cooperative service provision, such as the JFM case in the Netherlands. This latter case is especially useful for our purpose because it has also been initiated on a similar ground in the mid-nineties. In the beginning of the initiative, success was also measured in terms of the membership base, which determined the amount of subsidies allocated to the JFM organisation. However, because of the economic potential offered by this way of nature management, especially the substantial gain in transaction costs which we discussed in the previous section, this policy was gradually adapted. The subsidy scheme was abolished and the goal of the JFM organisation redefined in terms of a for profit service provider. As a result the JFM organisations started to focus on larger projects and larger forest owners, in order to guarantee their return on investment, and became a competitor of private consultation bodies. The example of the Dutch illustrates appropriately the two contrasting faces of the more complete JFM experience as it has been built in Flanders : its capacity to generate economic benefits, through offering a service with lower transaction costs for the forest owner, and its capacity, which failed in the Dutch case, to involve the small and fragmented forest owners which usually fall out of the scope of the regulatory policies in collaborative agreements around sustainable forestry.

Our interview with the BZK manger points to two important governance characteristics of the JFM institutions which conditioned successful cooperative action (cf. also De Maeyer and Seynaeve, 2005). First, it appears that the attribution of collective decision rights to the owners is an important condition for creating renewed confidence in collaborating on forest policy. Indeed, the owners feel “overregulated” and fear that the discussion with “pro-nature” minded administration and user groups will lead to even more regulation. If instead, and that is precisely the starting point of the new forest policy, extensive decision rights on management are delegated to the forest owners, through their participation in the collective management institution, this barrier is removed. The decentralization of collective decision making creates at least the possibility for them to collaborate without losing their capacity of initiative.

Second, increasing the participation of forest owners to forest management activities or to interaction with user groups in forest related activities has also played a key role in enhancing their motivation to collaborate on sustainability initiatives. The participation creates opportunities for common learning on the difficulties and opportunities encountered with

sustainable management. It is also considered by the forest owners as a way to receive recognition for their social role in maintaining a scarce natural resource. This latter aspect has also been confirmed by an extensive in depth survey on the attitudes of private forest owners in Flanders (Verheyen *et al*, 2006). As this study has shown, owners who actively exploit their forest mostly have a dynamic vision of their forest and most of them consider themselves as stewards of a piece of nature in the general interest. Therefore they are often disappointed that they receive not more recognition for their work.

In summary, the main focus of the JFM coordinators has been on “bringing the owners back to their forests”. In many cases, the coordinators evaluate the results of their actions not in terms of the surface area covered by common management plans, but by the amount of forest owners that participate to felling and clearing and the intensity of participation both of user groups and owners to different activities. In clear, they prefer to have an owner to invest time in cutting the wood and discussing with the JFM group about the management of his forest, then have this owner paying a private external body to draft the management plan in its place, even if it would be more effective. From their perspective, JFM is more about awareness building and increase in knowledge amongst forest owners, than about transaction costs.

3. Conclusion

In this paper, we have analyzed the contribution of dynamic institutional efficiency to enhancing overall resilience of managed biophysical systems. We argued that reflexive anticipation of mis-matches, interdependencies, non-linearities and intrinsic incompleteness is an important factor in the adaptability of the institutions. We have analyzed this challenge through the lens of institutional analysis, focusing more specifically on the institutional means put into place to scrutinize and built awareness on the incompleteness of the learning process. We have applied this framework to analyze the process of social learning in a recent experiment with joint forest management in Flanders

The key issue, from the point of view of building resilience, is to create a learning environment geared towards the development and recognition of new perspectives that were not selected or considered in the current institutional solutions. As such building resilience is both a distinct and complementary goal to the normal management process : it allows to broaden the possible perspectives and to verify if the adopted management rules do not need to be revised in a later stage due to unforeseen consequences⁷. The importance of such an environment for enabling social change has been at the core of research programs on governance, whether it be through the analysis incremental change in the interaction between economic and political environment (Douglas North), polycentric bargaining around network externalities generated by common pool resources (Elinor and Vincent Ostrom) or the role of epistemic communities in international environmental governance. What is common to these

⁷ What is important from this perspective, is not so much the choice between the rational actors' perspective (the economic and transaction cost approach) and the social learning perspective (the focus on learning and cooperation), or the choice between a “results” based approach and a “process” based approach, but the critical interaction between both. First, the social learning perspective shows that any transaction cost approach to institutional design will need a change in norms and beliefs to be effective. It is only through a co-evolution of the institutional rules and the context of norms and beliefs that a proper “alignment” of the most cost-effective institution and the context is possible. Second, beyond this mechanism of adaptation, organisations also have to build adaptive capacity and resilience for coping with change. So the awareness of the limitations both of the adopted rules and the current beliefs and social roles will remain a challenge to be dealt with, whether it be in the case of more market oriented JFM organisations such as in the Netherlands or the JFM of the Flemish type.

research programs is the recognition of the important role of intermediary or “boundary” organisations which can translate the actors’ concerns to the political environment.

As we showed through our case study, JFM organisations can precisely play the role of such an “intermediary organisation”. In the case of Flanders, the process of social learning was able to build a process of change in collective beliefs on sustainability and to broaden the scope of the cooperative network build around these beliefs. The key governance characteristics of this learning process is the attribution of decision rights on the management of the forest landscape to a collective management organisation, within a flexible legal framework. Progress on the involvement of small forest owners in the JFM organisation was accomplished through the purposeful organisation of self-evaluation of targets of sustainability and experimentation with forms of cooperation between the forest owners and user groups. Adaptation of the legal framework, as a result of this reflexive learning, was accomplished through the building of institutional relays, such as the recognized participation of JFM representatives in the political bargaining around forest policy in Flanders.

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Annex 1. Correspondence table between CSFM and BZK

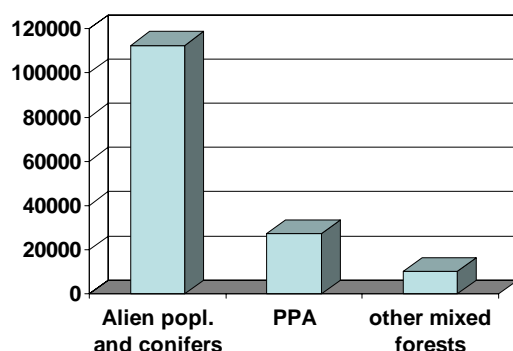
Criteria and Indicators of the Flemish Forestry Decree explicitly translated in operational targets	Indicators of the BZK forest management plan 2007-2012, p. 4 (validated by the JFM governing board, with specific quantitative targets for each indicator)
CSFM 2.1.1.	B.G. 2.3. Information and training activities
CSFM 2.1.2 / 2.1.3.	B.G. 1.1. Number of complaints a year
CSFM 2.1.4.	B.G. 3.5. Target area for access management plan
CSFM 2.3. / 2.4. / 3.1.1. / 3.1.4. / 6	B.G. 3.3. Target area for common management plan
CSFM 5.1.1. / 5.1.2.	B.G. 3.6. Target area for interventions for ameliorating ecological function (exotic species, access infrastructure)

Annex 2. 2006 Membership in the BZK focus area (source : 2007-2012 BZK management plan)

	Surface (ha)	Number of owners	% of surface in the JFM	% of owners in the JFM	Year of creation
Engstraat	44	51	61	69	2000
Eindhout	1116	226	34	24	2000
Bel	180	178	56	57	2000
Scherpenbergen – De Hutten	206	148	64	25	2002
Heidehuizen	139	122	43	34	2002
Oevelse dreef	23	3	74	100	2002
Teunenberg – Nieuwe hoeve	165	312	50	32	2002
Keiheuvel	221	462	19	16	2004
Veerle-Heide	40.3	57	34	30	2005
TOTAL	1134.3	1559	45	30	

Annex 3. Total forest cover in Flanders

Forests in Flanders : TOTAL forest cover : 150.000 ha (11% of land cover)



Alien popl. and conifers = planted forests with monoculture of poplars or conifers

PPA : Total area of forests in priority protection area's (Annex I of EU habitats Directive) and forests with high ecological value