Building resilience through dynamic institutional efficiency
The case of forest biodiversity

Tom Dedeurwaerdere
Université catholique de Louvain, Louvain-la-Neuve, Belgium,
Dedeurwaerdere@cpdr.ucl.ac.be

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Introduction

In this paper we address the challenge of building resilience in coupled social-ecological systems through the lens of institutional analysis. The question of resilience of social-ecological systems, and the related problems of vulnerability and adaptability, has received renewed attention because of the increasingly converging dynamics of globalization and coupled dynamics of social and biophysical systems (Young *et al.*, 2006). On the one hand, the process of globalization has led to increased interconnectedness and interactions operating at various scales, which introduces new external constraints on the social-ecological systems and hence raises new concerns of adaptive capacity beyond conventional notions of risk, stability and control (p. 314). On the other hand, social and ecological systems are increasingly linked, through the extension of managed biophysical systems, such as agro-environmental landscapes or fragmented forest landscapes composed of small forest patches in urbanized areas. To cope with new external constraints, these systems have to understand and modulate the internal dynamics of structural change in the coupled social and ecological processes, beyond reactive adaptation to global change.

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 and 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 and adaptability in social systems differs from adaptive capacities in biophysical systems (Young, p. 312). An important difference is the intentionality of actors in social systems and the ways this intentionality leads to the building of institutional devices that are supposed to cope with the new problems. Intentionality and institutional design *per se* is not enough to enhance the resilience of the social systems. When current beliefs (based on technical modernisation for instance) lead to institutional rules and behaviour that are ill-matched to the scale of the disturbances, things can continue to get worse rather than better – witness the debate about climate and biodiversity policy. Resilience of social systems will also require reflexive learning process that are able to generate a process of revision of beliefs in coping 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 analyse the role of institutional design and reflexive learning in building resilience through the question of dynamic institutional efficiency. 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. In this static approach the goal is to look for the most optimal institutional design given a certain model of the transaction situation. However, there is also another important aspect of institutional analysis, which focuses on what has been called dynamic efficiency (Aoki, 2001, North 2005, Eggertsson 2005, Dedeurwaerdere, 2006). Dynamic institutional efficiency focuses on enhancing the efficiency of the process of institutional change, that is the process of transition leading to a more optimal institutional configuration or the open-ended evolution of institutions in situations of persistent uncertainty. It's focus is on the creation of incentives for knowledge generation about new disruptive action possibilities and the creation of mutually supportive dynamics between institutional change and the changes in the social and political domains.

Static institutional design can be sufficient to build in adaptive capacities, when the effects of external shocks, the appropriate responses and their outcomes are reasonably well understood. For instance, from an institutional point of view, adaptive capacity can be build in long-term relational contracts (Williamson, 1996) or be enhanced by joint information processes amongst sub-units in firms or other organisational hierarchies (Aoki, 2001). However, in many situations the effects of the external shocks on the social and the ecological system are not well understood and the set of options or action possibilities for adaptation not known or not feasible in the actual social and political environment. In those situations, practical incentives for stimulating the exploration of the still uncertain institutional possibilities (in transition to equilibrium or still open-ended evolutions) will become important for the survival of the system. That's why we will tackle the question of building resilience in coupled social-ecological systems both from the point of view of static and dynamic institutional efficiency.

We will apply the question of institutional design for the governance of coupled social-ecological systems to the specific case of small-scale forestry. The case of managed forest landscapes seems an appropriate test field for analyzing the contribution of dynamic efficiency to resilience. In managed forest landscapes, the slow evolution of the biophysical system is confronted to new rapidly evolving constraints such as the biodiversity crisis and global market pressures. To analyse the resilience and adaptability of these systems and illustrate our analysis, we will focus on a specific case study which is the case of joint forest management organisations in Flanders, where a specific model of dynamic efficiency has been implemented. This model is based on an important model of dynamic efficiency, which is the model of pragmatist learning process developed by Charles Sabel. In the case of the forest groups, the pragmatist learning is implemented through three particular mechanisms, that is through : (1) the recourse to sustainability criteria and indicators as an open ended learning device allowing to redefine the current beliefs around sustainable development, (2) the experimentation with disruptive action strategies to put the new beliefs into practice and (3) the building of new forms of social cooperation around these new beliefs and practices. By a detailed analysis of these three mechanisms, we expect to illustrate our general argument on the contribution of dynamic efficiency to the building of resilience and to evaluate more specifically the effectiveness of this particular model of dynamic efficiency in increasing resilience and adaptability.

In the first part of the paper, we present our case study by analyzing how forest management organisations have been able to adapt to the specific constraints of human-ecological landscapes composed of small-scale forests with fragmented forest ownership. In the first section, 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.). Further, 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 the contribution of dynamic institutional efficiency to adaptability and resilience. First we analyse the mechanism of pragmatist learning that played a role in organising the process experimentation with new beliefs of sustainability (section 2.1). Second, we'll focus on the social embeddedness of this process, by analysing the dynamics of the enforcement of the norms of cooperation between the different types of forest owners and the forest user groups (section 2.2.).

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

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. In Flanders the relevant ecological regions have been determined on the basis of historical common management area's of large adjacent forests, giving rise to 19 JFM organisations that cover the entire region of Flanders. In the same JFM organisation one will find different categories of forest owners, 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, an 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 biodiversity[2] :

- 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 form 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-excusive 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 lead 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).

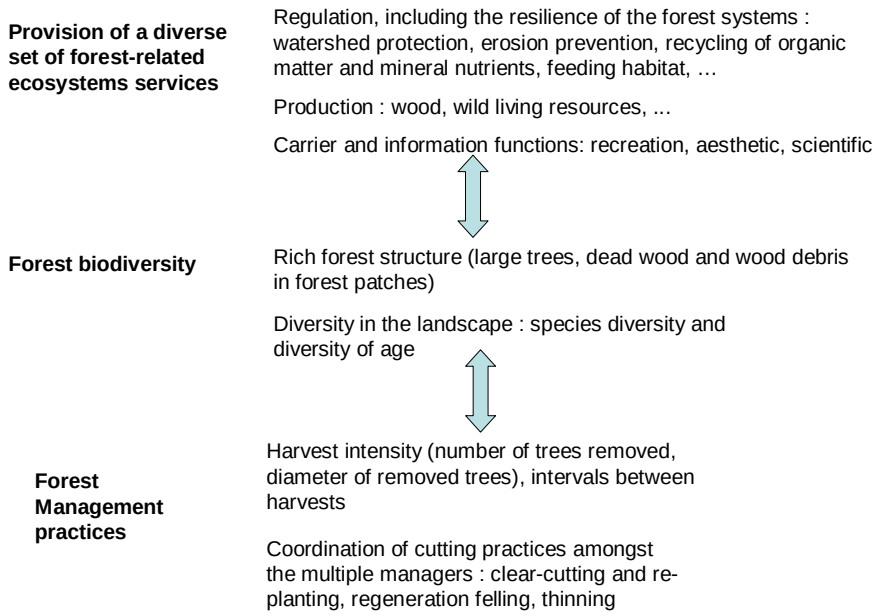

figure 1. Relationship between management practices, forest biodiversity and ecosystems services (figure by the author)

1.2. The insufficiency of the command and control regulation and the contribution of JFM organisations as participatory hierarchies

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 – thinnning 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.

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 5ha[3].

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 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.

Why was this innovative scheme successful, in a policy field where the command and control and economic incentive policies that was already in place from 1990 to 1996, were not able to

[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).

produce the expected outcomes ? The failure of the transition to sustainable forest management cannot be explained by an insufficient level of economic incentives such as cost-share policies (Serbruyns and Luyssaert 2006). For example, as pointed out by an in depth study of forest conversion which includes the BZK working area, the economic incentive scheme covers more than the costs and the lost revenue of forest conversion to the forest owner (Verheyen et al 2006, p. 73). For instance, the lost revenue is estimated to be between 45 and 96 Euro's/ha/year for conversion from a Corsican pine stand to pedunculate oak under a rotation period of 77 years (*Ibid.*, p. 71), while the direct subsidies are around 150 euro per ha yearly. Nevertheless, between 1990 and 1999 only 200 to 250 owners per year applied and received the reforestation subsidy, while only 133 ha and 317 ha respectively applied and received the subsidy for forest management plans and for opening up their land for private use (Serbruyns and Luyssaerts, p. 287). Second, from an ecological point of view, the 1990 Forest Decree was already based on the detailed set of criteria and indicators for multifunctional forest use and management, which have been agreed upon in the PanEuropean Forstry pocess, where both forest interests and nature movements were represented. Hence it seems that the issue at stake here is not the lack of economic incentive policies or inappropriate legal concepts from an ecological point of view.

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 lead 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.

However, the literature on institutional economics also shows a second aspect of the contribution of JFM organisations to more effective forest policy. To the question of the existence of the firm, Coase pointed to two kinds of cost reduction that can be accomplished by organisations : the cost that may be saved by making a long-term contract for the supply of some articles or services instead of short-term successive contracts and the cost of discovering what the relevant prices are. The first type of costs has lead to theories of what is the most important parameter for transaction cost saving, given the incompleteness of long term contracts. This is precisely the benefit provided by the JFM organisations on which we focused above. The second type of costs has lead to a focus cost savings that can be realized by organisational coordination substituting for market coordination. The origin of this second type of cost saving lies in the bounded rational nature of human actors. Individuals are limited in their scope of attention, in their ability to monitor the environment and calculate optimal decision choices, as well as in their range of activity. Organisations may thus be considered as a device to partially overcome these individual limits by division of cognitive labour. In particular, in the case of the sustainable forestry, this second focus plays an important role in revealing and coordinating the different forest related values which cannot be appropriately addressed by market coordination. They can do so by developing appropriate organisational

rules and procedures for building collective preferences and defining multiple objectives, routines and norms regulating communication and collective decision making.

The most important distinction between organisational architectures that is relevant for our purposes is the distinction between functional hierarchies and participatory hierarchies. Indeed, the functional hierarchies characterized the command and control policies of the first stage of implementation of the forest decree. It is characterized by independent information processing by the different horizontal sub-units, the individual forest owners writing their felling permits and subsidy applications, and the transmission of their results to a centralized coordination body which process this information an independent manner, the forest administration. Along the horizontal dimension, the information processing is hence characterized by information encapsulation, along the vertical dimension by hierarchical decomposition.

From a theoretical perspective, functional hierarchies are most efficient when the cost of communication between the coordinating unit and the subunits is low, which justifies the hierarchical decomposition, and when the different tasks of the sub-units are not complementary, which justifies information encapsulation between the units. However, both of these optimal conditions are not satisfied in the case of small-scale forestry. Within the vertical dimension, the main difficulty is the high monitoring cost for a centralized agent to verify the compliance with the new regulations implied by multifunctional forestry. Moreover, a subsidy scheme requires some investment in information gathering and drafting of the subsidy applications on the side of the private forest owners. These transaction costs are often too high compared to the low value of the gains to be made from these schemes in the case of small forest plots. Indeed, both the monetary gains (subsidy per ha) and the non-monetary gains (such as offering access for recreation) only become significant in the case of larger plots. Within the horizontal dimension, the information needed for activities such as building rich forest structure and access management in landscapes with fragmented ownership relies on complementary tasks of information processing which can be organized more efficiently in the information assimilation mode. Hence, in cases where it is difficult to alleviate these high monitoring and transaction costs along the vertical dimension and where collaboration is needed along the horizontal dimension one expects a low effectiveness of the command and control policy.

The forest groups introduce elements of joint information processing (information assimilation) both along the vertical and along the horizontal dimension. Indeed, along the vertical dimension, the drafting of the forest management plans is realized through the help of the forest group coordinator, whose main role is to involve the owners in the organisation of the information coming from the different forest plots. Along the horizontal dimension, the general assembly of forest owners discusses and approves the specific organisation of wood selling and intervention in the forest landscapes, based on the common knowledge base that is build for the specific forest landscape that is managed by the group.

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

Analysing decentralized forest management through JFM organisations 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 two important aspects of dynamic efficiency : reflexive learning and the enforcement of new norms of cooperation.

From a theoretical perspective, the dynamic approach aims to extend the question of institutional design, to the non-equilibrium situations of transition or open-ended evolution. In the equilibrium approach adopted in the search for static efficiency, cooperation is the equilibrium outcome of repeated interactions between strategic players, including the enforcer of the cooperative game. From this perspective, following the approach developed by Masahiko Aoki, forest groups can be characterized as participatory hierarchies, characterized by a high degree of joint information processing between the forest owners (along the horizontal dimension), especially in the building of the common knowledge base of the specific forest landscape, and between the owners and the forest police authorities (along the vertical dimension), especially in the drafting of the joint forest management plans. In this model, the role of the forest coordinator can be understood as an external monitor of the team work, as developed in several game theoretic approaches of free riding in teams (Alchian & Demsetz ; Holmstrom)[4]. Some aspects of this model are clearly relevant for the understanding of the functioning of the forest group, when it is considered as a well established organisation that reveals, and coordinates amongst, existing interests and beliefs of the forest owners in regards to the different non monetary values of the forest landscapes. However, it is insufficient for understanding the actual process of transition to sustainable forestry where interest, beliefs and possible action outcomes are not yet well established. Moreover, the forest groups themselves are still in a process of institutional evolution and the view of cooperation as an equilibrium outcome does not allow to understand the internal process of change in behavioural routines that is needed to move from centralized forest policy to decentralized forest management in the so-called participatory hierarchies.

In the case of Flanders, reflexive 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 institution[5].

[4] Building upon the work of Alchian and Holmstrom, two models of effective group work : budget breaking by the third party and monitoring of free riding. In the forest groups, along the vertical dimension, budget breaking clearly plays a role, the forest administration and the forest police still plays a role as a third party : (a) only budget for the forest coordinator and different subsidized activities if the 5 years' management plan of the organisation is approved (b) intervention of the forest group in a certain forest complex also increases the chance of a forest owner to be caught when violating the forest law. There is no real issue of free riding as the membership is voluntary.

[5] 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.

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. These two aspects correspond to the double aspect of dynamic efficiency developed by Aoki in his comparative institutional analysis (Aoki, 2001). From a general theoretic perspective, the institutional dynamics, in situations of open-ended learning depends on the opening of new perspective within a certain domain (the subjective or cognitive dimension of the mechanism of change), but also depends on the interaction with other domains, which can be mutually supportive, neutral or antagonistic (the objective dimension) (Aoki, 2001).

The subjective dimension focuses on the mechanism of institutional evolution from the angle of agents' subjective games. This covers both processes of incremental learning in the agents beliefs, as developed by Aoki, and, as we will see, process of disruptive learning, where new beliefs are formulated and tested in a pro-active manner by the agents. But new viable rules for action choices are not selected in an entirely subjective way, even though they are, to some extent, influenced by the agents' experiments in his choices. They are selected primarily through the dynamic interactions of the strategic choices of agents across different domains. These dynamic interactions constitute the objective dimension of institutional evolution. If we consider only the most basic types of domain considered by Aoki, they essentially consist in the interactions between the informal regulation, the market and the organisational on the one hand and the embeddedness of these domains of private governance in the social and political domain on the other hand.

In the following we will first analyze the subjective dynamics in change in beliefs in the participatory hierarchies related to key concepts such as biodiversity and sustainable yield, both on the side of the forest owners and the decision makers. This will be the object of section 2.1. Second, we will analyze the role of cross-domain interactions in the process of transition to sustainable forestry. Because of its importance for understanding the origin of the successful collaboration within the participatory hierarchies, we will essentially focus on the question of the embeddedness of the participatory hierarchies in the social exchange domain. This will be the object of section 2.2., where we 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.

2.1. Dynamic efficiency of change in beliefs

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

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 (cf. table 3). Three 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.

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.).

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. There 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 though 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)[6] 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.

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

What kind of limitations does this comparison reveal from a dynamic institutional 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, from a static perspective the use of indicators allows to create a flexible framework for implementing the forest legislation and for coordinating and monitoring the use of different subsidy and economic incentives from different authorities (both regional and European). From a dynamic perspective, the legal framework leaves the different forest groups room to build their own operational management plan by selecting the set of indicators that they consider most relevant for their own forest landscape. As such the use of indicators allows a process of internal self-evaluation around feasible and evolving targets in the collective management organisation and a process of feedback to the government, leading to the design of new incentives schemes or adjustment of its policy.

2.1.2. Learning by mutual monitoring

Our hypothesis is that the productive learning in the forest groups has been made possible through this use of the criteria and indicators as a flexible and open-ended monitoring device. The conditions for the use of monitoring as a learning device in open ended situations have been studied in more detail by Charles Sabel, both in the context of firm behaviour, in the so-called non-standard firm, and in the context of public policy, in so-called deliberative polyarchies. Because of our interest in the origin of cooperative learning between non-industrial private forest owners in the forest groups, we will mainly focus here on the theory of the non-standard firm. In his approach, Sabel highlights two conditions for open-ended learning : first, the role of practical incentives for promoting the exploration of "disruptive possibilities" (Dorf and Sabel, 1998 : 286) and, second, a set of institutional rules that define the engagement in the cooperative enterprise. First, to establish initial product designs and production methods, firms turn to benchmarking: exacting survey of current or promising products and processes which identifies those products and processes superior to those the company presently uses, yet are within its capacity to emulate and eventually surpass. Benchmarking allows thus a comparative evaluation with possible improvements and a such provides an incentive to disrupt the current routines and representations of possible outcomes. Further incentives for promoting the exploration of disruptive possibilities are simultaneous

engineering based on the initial benchmarking and correction of errors revealed by the new action possibilities. Second, beyond these practical incentives, generating collaboration and change in the non-standard firm also depends on an institutional context which defines a set of rules of engagement of the actors in the joint enterprise. These rules require mutual monitoring of each participant's contribution, information sharing and the mutual assessment of each participant's reliability in relation to the joint activity.

Based on these two conditions, the practical incentives and the rules of engagement, we can expect increased productive learning in the forest groups to occur when the monitoring process generates (1) a process of joint investigation and comparative evaluation of disruptive possibilities and (2) a process of mutual comparison to verify the reliability of the outcomes proposed by different groups. In the cases where these conditions are realized, one expects a broadening of the set of possible productive action strategies beyond the current routines and representations of the organisation.

The critical element in this process is the change in beliefs and the identification of the specific impact on the management practices in the provision of ecosystems goods and services. Based on the pragmatist model of Sabel, we can distinguish between two different types of successful learning processes : first, incremental learning processes, which have lead to improved outcomes, but remained within the current representation of the problem situation and second, disruptive learning processes, which have lead to improved outcomes through the recourse to benchmarking and mutual monitoring of action possibilities that go beyond the given representations of the forest group. An example of the first type of learning is the adjustment of the level of direct and indirect subsidies to the forest owners in the framework of the 1990 Forest Decree, but without reconsidering the basic premises of the economic incentive politics. An example of the second type is the disruptive learning within the 1996 pilot project, which lead to the establishment of the first forest group, and which was based on the idea of the need of cooperative learning beyond the economic incentive politics (cf. figure 1).

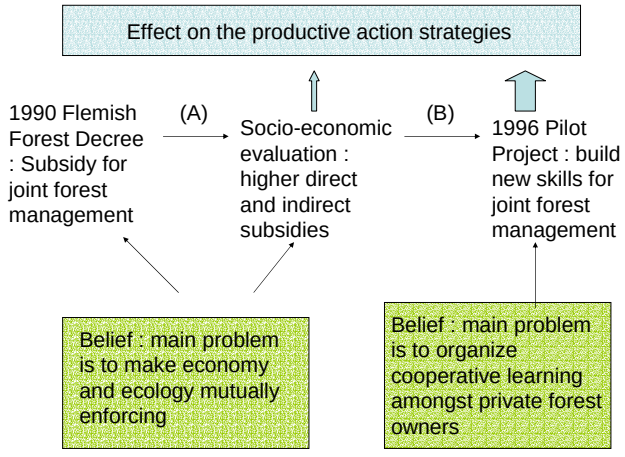

Figure 1. Learning within a given belief (A), as in the socio-economic evaluation of the impact of the new forest policy (cf. Verheyen, 2006), and learning within a disruptive belief (B), leading to the experimentation with a new institutional device.

Within the BZK forest group, both incremental and disruptive learning was organised in the process of drafting and evaluating the operational targets for the adopted criteria and

indicators. The main belief is the same as the 1996 pilot project, that is the need for organizing cooperative learning amongst private forest owners in the so-called participatory hierarchies. Incremental learning within the frame of this belief played a role for instance in the choice of the focus on small owners in the drafting of the joint forest management plans. An experiment was organised in 2006 with the outsourcing of the drafting of the management plan to an independent consultant in the case of larger forest owners (Bosgroep Zuiderkempen, 2006). This experiment produced some positive outcomes and further experiments will be organised to improve this possible partnership with independent consultants for dealing with large private forest owners. This adjustment in the focus of the core activities of the forest group on small owners is situated within an attempt to diminish the transaction costs in the organisation of the cooperative learning.

Disruptive learning played an important role in the further development of the implementation of the concept of the forest groups, especially after the adaptation of the Forest Decree in 1999 (personal communication, 2007b). An important new belief that emerged was the idea that the main problem that remained unaddressed was not so much further improvement of the efficiency of the cooperative learning, but the creation of a sense of responsibility of the private forest owners for the common natural heritage through "bringing the owners back to their forests". From the perspective of this new belief, the selling of wood for instance should not be part of the core activities of the forest group, but rather be outsourced to a forest cooperative, as it is focused on an economic activity without implications on the change in the attitudes towards the common heritage. The experiment with the outsourcing is still ongoing, as two other forest groups joined in 2007 with BZK in the creation of the first forest cooperative as a distinct organisation for the selling of small forest wood products. On the other hand, this new belief lead to the experimentation with an increased involvement of forest groups in the eradication of invasive species and thinning activities, because these are new occasions to involve the forest owners in the management of their own forest land.

The learning processes in the forest groups have been able to generate both innovation in strategies and diversification of representations within and between the forest groups. Some of these experiments have lead to a change in action strategies and operational targets approved by the general assembly. Other resulted in the rejection of the new proposed action strategies, because they did not lead to improved outcomes. All these changes were not just the result of communication process in the context of existing beliefs[7], such as in the static approach, but the result of a process of experimentation which aims at broadening the set of workable strategies and objectives considered by the forest group.

2.2. The dynamic interaction with the social exchange domain

However, the results of these learning processes have not been uniform over all the components of the multifunctional forestry and, moreover, some of the failures cannot be explained by the absence of the conditions for organizing joint experimentation in the JFM organisations. In particular, important components which impact on the broader user

[7] Be it the beliefs of the government (then the forest group would only be the "transmission belt" of the government policies) or the beliefs of the forest owners (then the forest group would be a neo-corporatist model of a private governance architecture). The disruptive learning model allows to combine the appropriation of the C&I from the point of view of the forest owners cognitive frames, but also to show progress beyond those frames because of the legal constraint of integrating aspects of multifunctional forestry where relevant (and the requirement to show effort in doing so to be legally recognized as a forest group, and hence entitled to receive the subsidies).

communities of the forest ecosystems services, such as for issues of access to the forests for recreation or for biodiversity, have not lead to significant improvements compared to the situation that prevailed before the creation of the forest groups.

In order to understand these differences in performance, we need to move beyond the first aspect of dynamic efficiency, which is the generation of new beliefs and strategies in the transition from one governance framework to another. Indeed, both the successful components of multifunctional management, such as wood selling, invasive species and joint forest planning, and the less successful components, such as the local user related ecoservices, are part of the criteria and indicators device that is used in the forest groups. So they are the object of the same incentive mechanisms of joint exploration of capability through self-evaluation of action outcomes and mutual monitoring for increased improvement. What is missing here, is the understanding of why in some cases these mechanisms effectively have lead to cooperative learning and in other cases failed to generate initiatives for experimentation beyond the sub-optimal collective outcome.

As stated above, the institutional dynamics, in situations of open-ended learning, not only depends on the opening of new perspective within a certain domain (the subjective or cognitive aspect of the mechanism of change), but also depends on the interaction with other domains, which can be mutually supportive, neutral or antagonistic (the objective aspect). Because of its importance for understanding the origin of the successful cooperation within the participatory hierarchies, we will essentially consider the interactions with the social exchange domain.

The social exchange domain can be stylized in a schematic manner as the one in which social symbols (languages, rituals, gestures, gifts, etc.) directly affect the payoffs of players, such as esteem, emotional rejection, sympathy, benign neglect, and so on, and are unilaterally delivered and/or exchanged with "unspecified obligations to reciprocate" (Aoki, 2007). As has been shown in the literature, even if the organisational domain and the social domain have different temporal dynamics, the interaction between the choice of institutional rules of the governance mechanisms and the social exchange domain can be mutually supportive or antagonistic. In the latter case this can lead to crowding out of the set intrinsic preferences which stimulated cooperative behaviour before the introduction of the new governance device. On the contrary, productive interactions between the two domains can reinforce the effectiveness of the new governance device, such as through decreasing the monitoring costs or increasing the involvement of the players in cooperating beyond the consideration of strategic interests[8].

The main progress in building new norms of cooperation in the forest groups has been achieved by creating cooperation between the nature associations on the one hand and the forest owners on the other. Indeed, these two groups have traditionally very different positions, the first favouring for instance buy back policies of forest to non-profit organisations or to government, allowing to implement a strict biodiversity protection policy, and the second favouring economic incentives and market mechanisms. A second case where cooperative

[8] 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.

learning has been built is between the active and passive forest owners. 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.

Amongst these different groups of forest owners, only between 3% and 13 % had initially a positive attitude towards collaborative forest management. This situation corresponds to the one that prevailed between 1990 and 1999, where no Joint Forest Management organisation existed (except for the pilot project). Self-organised forest groupings could already apply for subsidies, but with very low success rates (mainly the environmentalists and the active forest owners). 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. Through the creation of the forest groups the average involvement rate is between 17,34 % (in the initial phase) and 41,76 % (after some years) in the selected focus working areas (boscomplexen). The BZK organisation hence was able to involve part of the active users and passive owners in the activities of the joint forest management.

From the point of view of governance theory, the contribution of the new social groups to forest governance can be modelled as a situation where cooperation is build through a combination of instrumental trust, based on reciprocity and enforced by increased transparency and means of verification, and social trust, based on symbols (languages, rituals, gestures, etc.) and enforced by creating respect and esteem (ref. Tom Tyler). Indeed one of the major challenges that forest policy has to face in building cooperation is the lack of trust of the private forest owners in government and the lack of trust between the different categories of forest owners. As has been shown by extensive survey in Flanders, the forest owners show a high degree of distrust in the government and place the highest trust in technical engineers from the forest administration. To build trust with the government and amongst the forest owners, the forest groups have focused both on instrumental and social trust, the former by enhancing verification of reciprocity through the C&I process, and the latter by enforcing the social identities of the forest owners, through generating respect for the owners' ideas and interests and bringing owners back to their forest and stimulating a sense of forest stewardship (Bosgroepen, 2005).

The concern for the generation of social norms of esteem, prestige and unspecified reciprocity is clearly present in the forest groups. For instance, in the report of the forest groups on their vision and mission, a set of defensive routines is contrasted to the situation where a process of reframing can build new conditions for cooperation (Bosgroepen, 2005). The proposed methodology for building social trust is based on building openness for accepting change in their cognitive frames that condition cooperation. This methodology is based on a three step cognitive process, generating (1) openness and respect for the owners' ideas and interests, (2) involving the owners in the decisions on sustainable management and (3) bringing the owners back to their forest and stimulating a sense stewardship. 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. The concern for building esteem and recognition hence is a key component of the forest group activities. In that respect, the different mechanisms for enforcing the social norms amongst the forest owners and the learning process in the direction of multifunctional forest management in the organisational architectures can be considered as being mutually supportive.

The main characteristic of the methodology used in the JFM organisation for rebuilding trust is that all the actors are considered and treated from the perspective of forest owners and forest managers. Indeed, that is the common thread in the way in which nature associations and private owners are brought together or the way cooperation is build between active forest owners and recreationists. In these examples, no new action identity is built by the different owners around the concept of multifunctional management. Instead, the old identities are simply reproduced within the new framework. Hence, the limit of this methodology for building social trust is that it is incapable to point to the need of a more profound transformation of the identity of the forest groups, in relation to the remaining challenges for addressing the issues raised by the users of the forest related ecosystems services and the building of cooperation with the local communities.

However, within the forest groups, there is also a second approach, which takes into account the limits of this first approach and attempts to address the challenge of broadening cooperative learning wit the users as a "third party", without subordinating this cooperation to the current identity of the forest groups understood as representing forest managers. Indications for such a second approach are clearly present in initiatives such as the experiment with the access negotiations in the Bosgroep Zuiderkempen and the integration of the complaints of the local population in the working of the forest groups (Bosgroepen, 2006). This is also reflected in some position statements by the forest groups, on the cultural and social values of the forests, the concern frequently expressed about the remaining gap between the interests of the nature associations on the one hand and the inhabitants and the forest owners on the other (Bosgroep Zuiderkempen, p. 6 ; Bosgroepen, 2005, section 2.2.1.). For example, the report on the mission of the forest groups states : "the forest manager, in the use and management of his forest, has to consider the social and cultural interests of the inhabitants and the broader region. This implies the recognition of his social responsibility". Moreover, in the forest group BZK, systematic inquiries are held into the needs for access agreements, recreation in private forests and adjustment to social and cultural values of the forest (Bosgroep Zuiderkempen, p. 28). Hence, instead of the reproduction of the old social identities, within the context of a new cognitive frame, as is the case in the first approach, this second reading allows to identify a more profound transformation that is going on in the same time, which is a more fundamental transformation of the identity of the forest group as the basis of the cooperative orientation that conditions further productive learning.

It is possible, from this perspective, to situate the attempt of the BZK forest group to develop new experiments with access management plans, where the users of the forest are considered as a "third party" to be associated to the activities of the forest group. Indeed, the development of a methodology for access agreement to the private forests is an important case for the development of new types of cooperation between owners and users. However, mostly the initiatives for developing access management plans are impeded by the distrust between user groups and owners. Through the attempt to rebuild the social identity of owners and users as actors with a common concern for opening up the forest, providing them with mutual respect and higher social esteem, BZK attempts to make the social dynamics and the dynamics of institutional change mutual supportive.

By addressing the reconstruction of the collective identity of the forest groups through experimenting with the association of the forest user groups to its activities, the initiative of BZK is able to address the failure of the static approach to institutional design to take into account the interaction with the changes in the social domain. The BZK has been one of the few forest groups to explicitly design experiments for developing new methodologies beyond the issues identified by the main forest owner groups. Due to the success of this limited experiment, BZK plans to launching a second experiment, in the period 2007-2012, for developing a methodology addressing the problem of enriching the structure of the forest landscape (Perrings and Touza-Montero 2004 ; Van Gossum et al. 2005), which has also shown to lead to defensive reactions both of the forest owners and the inhabitants (personal communication, 2007a).

Conclusion

In this paper, we analyzed the contribution of dynamic institutional efficiency to enhancing the overall resilience in the particular case of the governance of fragmented forest landscapes. Through the analysis of the specific case of joint forest management organisation in Flanders, we attempted to evaluate the contribution of dynamic efficiency to the provision of forest related ecoservices and to the enhancement of the resilience of the coupled social-ecological system.

First, from the point of view of the analysis of dynamic efficiency, we analysed the implementation of multifunctional forest management amongst private non-industrial forest owners in Flanders. We have shown the role played by three different institutional models, which are the command and control regulation, the participatory hierarchies and learning by mutual monitoring. As shown by our analysis, the combination of joint information processing in participatory hierarchies and open-ended experimentation through learning by monitoring has allowed to move beyond the insufficiencies of the command and control policy of the first phase of the implementation of the 1990 Flemish forest decree. In particular, the use of a legally defined set of criteria and indicators as a flexible and open-ended monitoring device has shown to be an effective mechanism for generating continuous improvement[9]. Second, from the point of view of the contribution to increased resilience of the coupled social-ecological system, we evaluated the contribution of dynamic efficiency to the adaptation of the forest management practices to new market opportunities for small-scale wood products, the decrease of global and local biodiversity and new social demands from forest user groups. We have shown that open-ended and disruptive learning allowed to integrate important non-market values such as the landscape diversity / mainly spatial externalities (through the joint forest management plans) and species diversity (through the combating of invasive species) in the forest management practices. However, the adaptation to new social demands such as recreation in private forests remains a difficult issue in the highly urbanized forest landscapes in Flanders.

[9] Further empirical studies are needed to disentangle the exact contribution of these different mechanisms. It could focus on comparing the relative role of the different factors identified in this paper in enhancing the provision of the ecoservices : (1) the contribution of credible commitment of the government through its capacity of budget breaking (in the static efficiency model of the participatory hierarchy) (2) the contribution of disruptive learning (decentralized choice of C&I combined with requirement of progress to full C&I) (3) the importance of social trust.

Our analysis also indicates some directions for further research. An important question is to further analyse the scope of the participatory hierarchies as a governance mechanism to address the remaining difficult issue of access management and (internal) diversity of forest structure. As we have seen, in the case of the establishment of the joint forest management plans and wood selling, benchmarking and mutual monitoring played a key role. However, because of the early stage of the experimentation with the access management plans, further research is needed to highlight the relative importance of the different practical incentives which we highlighted in our analysis of the pragmatist model of Sabel. In particular, because of the high degree of interdependencies of the decision of the different user groups and owners in a given area, it might be that the mecanisms of co-design and mutual error correction should deserve more attention than in the former cases.

Second, our analysis also shows the needs of further evolution on the level of the legal framework. Indeed, every phase of institutional experimentation has been followed by a phase of legal consolidation of the new governance mechanism, based on the considerations of most optimal institutional efficiency. This has been the case in the revision of the Forest Decree in 1999, installing the forest groups as an official implementation tool within the forest regulations, and with the implementation decisions of 2003, providing additional regulations for the operational management, in particular their establishment as independent non-profit organizations. However, in spite of the important progress, the participatory hierarchies as such are not a guarantee for improving issues such as forest access management and forest biodiversity. In particular, the ongoing experiment with access management, if successful, will provide an opportunity for further revision of the legal framework, in particular related to the regulation of access to private forests in Flanders. The new legal framework will probably contain some elements of the participatory hierarchies implemented in the forest groups, but the precise formulation will depend on the new action possibilities open-up by the ongoing experimentations.

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Annex 1. Correspondence table between CSFM and BZK

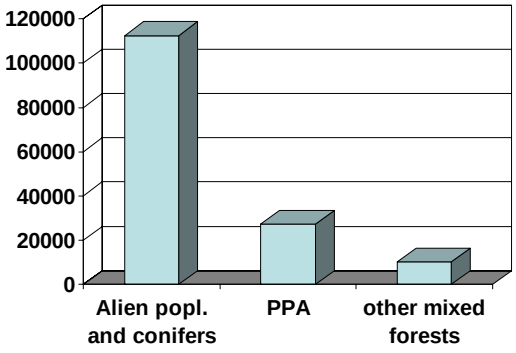
Criteria and Indicators of the Flemish Forestry Decree explicitly translated in operational targets	Indicators of the BZK forest management plan 2007-2012, p. 4 (validated by the JFM governing board, with specific quantitative targets for each indicator)
CSFM 2.1.1.	B.G. 2.3. Information and training 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 confiers

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