



COmmunity-based Management of  
EnviromenTal challenges in Latin America



## D3.4: “Community-based sustainable management and governance models in forest systems”

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# Executive summary

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The transformations produced by the evolution of population trends production and consumption patterns have raised concerns among scientists, governments and civil society. Some of the major changes have been: carbon levels growth; overexploitation of natural resources, economic crises and pollution, hence the spread of worries about the collapse of countless Social-Ecological Systems (SESs) in the 21st century have grown.

Due to the challenges that natural resources degradation imposes to science and policy, increasing efforts have been made for analysing SESs functioning, and to search the characteristics or variables that lead to their sustainable management or their destruction, as well as the probability of occurrence of one or the other. There is nowadays a broad consensus on the multiple successes of communities in achieving positive governance outcomes.

Forests systems play a key role due to the positive impacts they exert on the environment and to their contribution to people's livelihoods, most of all in the less developed countries. Research on forests has made great theoretical contributions -especially to the theory of the commons-. Forests systems are embedded in specific settings or contexts at different levels and interact with social systems across temporal and special scale; as a consequence they are a source of complexity when studying its dynamics.

Addressing the governance issue, and in this case, forest governance implies harnessing and analysing two dimensions: governance as structure and as a process, moreover, an adaptive governance approach, namely an iterative process of governance adjustments is to be considered, this deriving in the broader concept of co-productive governance. In this sense, the context or settings in which a SES is embedded plays a major role in understanding the governance dimensions. Moreover, combining the factors of institutional design with the key issues of the governance process offers an opportunity to exploit complexity and to set guidelines for achieving better governance outcomes in the communities.

Making generalizations of the outcomes from a specific case study that can be applied to any SES is impossible because there are no panaceas, but certainly, the effort of dissecting and harnessing the complexity of a given SES can be useful to understand the strengths, weaknesses and challenges that communities face nowadays, as well as to propose common attributes approaching a common framework for forest governance models. Therefore, some of the main outcomes of a three year research process in a SES in Santiago Comaltepec, in the south of Mexico, where the community has achieved robustness, it is to say that the SES has prevailed over time and that its institutions have adapted to change to a certain degree, are used to approach a common framework for facing future challenges.

Forests and communities interacting with them will face important future challenges. Some of the main ones can be climate change, market pressures and environmental policy shocks; factors should be taken into account when analysing systems dynamics. This implies highlighting the importance of the study of the context that encompasses any SES.

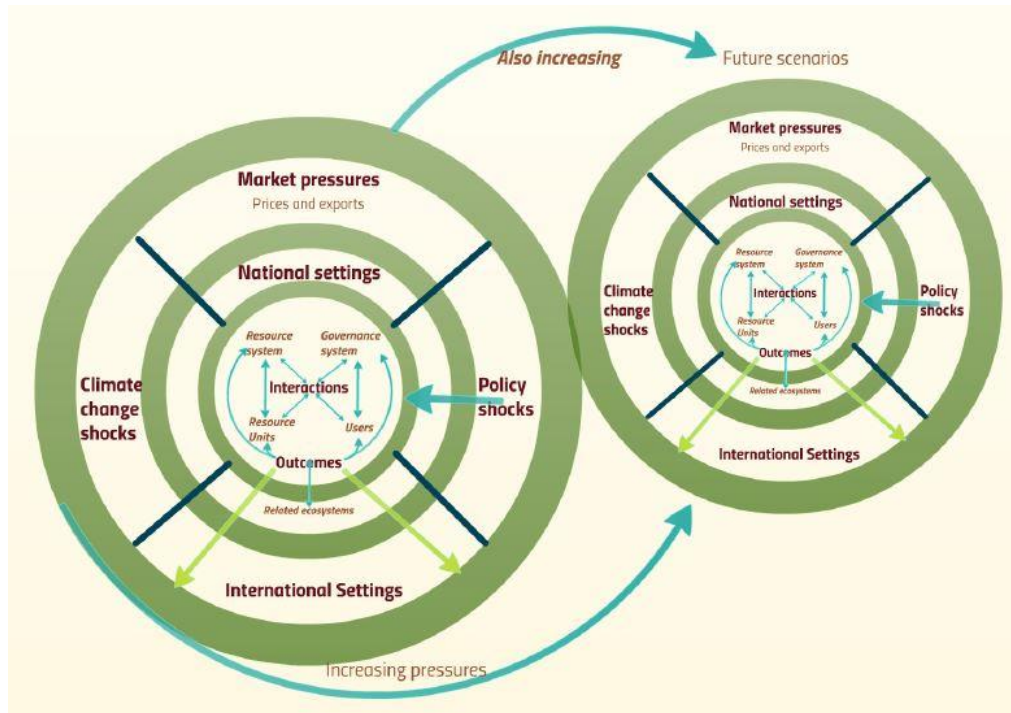


Figure 1. Forests governance dynamics framework.

Source: authors' elaboration based on Ostrom (2009a: 420)

The time horizons are as well a new source of complexity with which it has to be coped. Communities and policymakers need to form expectations of future challenges across the short, medium and long terms.

In a common framework for forests governance, factors of institutional design or governance structure, as well as processes and challenges in which governance is involved are to be taken into account.

### Policy implications

Communities are generally involved in the policy-making process and the natural resource management only in a partial way. This can be noticed not only by the passive role communities' play in discussion forums, but also in the official programmes orientated to compensate the income of rural families, making locals less dependent of the resource. Community-based management of natural resources claims a new set of policies with new characteristics. Which the main features of new policies should be?

- Acknowledgement of the communities' rights as active stakeholders in the policy-making process given the context of the natural resources, thus securing their rights, not only relying on them the responsibilities of natural resources preservation.
- New policies should also enhance the conjunction between the theory and the practice. Sometimes theorization set practical governance issues aside

because of the inherent complexity of the reality (multi-variable processes interacting in a dynamic context).

- By keeping constant the policy characteristics that have already led to a sustainable management of the natural resources, new policies should also be flexible, thus allowing the SES's adaptation to changes suffered in the different tiers of the context in which a SES is embedded.
- New policies should be able to endow communities with capacitation, physical capital, and new tools to improve the decision-making and conflict-resolution processes, in case they are weakened.
- Scientists originated from the community with a natural resource should be supported by this new generation of policies, in order to achieve the practical-theoretical links' strengthening.
- Main emphasis must also be done on bridging the gap between the economical and the environmental benefits obtained from the natural resource. This is especially true for poor communities that do not perceive the benefits from having a sustainable management of the natural resource.

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# List of abbreviations

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|          |  |
|----------|--|
| COMET-LA | COmmunity-based Management of EnviromenTal challenges in Latin America |
| CPR      | Common Pool Resource   |
| PSA      | Prospective Structural Analysis  |
| SES      | Social-Ecological Systems  |

## 1 Social-Ecological Systems and the Governance Issue; as a Means of Introduction

Worries about inevitable biophysical and social changes and the future challenges imposed by them have increased around the globe. Some of the main changes include: carbon levels growth, overexploitation of natural resources, pollution, extreme weather events, economic crises and political changes (Rijke, 2012; Ostrom, 2007a). The spread of worries about the collapse of countless SESs in the 21st century (Ostrom, 2007a) has raised concerns among scientists, governments and citizens (RRI, 2014a; Ostrom, 2007a). Hence, increasing efforts are being made for analysing socio-ecological systems' functioning, and to search the characteristics or variables that lead either to the achievement of positive governance outcomes or to the systems' degradation, as well as the probability of occurrence of one or the other (Ostrom, 2009a; Poteete et al., 2011).

The challenges imposed by pressures on SESs have been the key to scholars' growing attention to natural resources governance. As a consequence, the literature about forests has also grown significantly over the past two decades and efforts to search how to govern forests more sustainably and equitably have intensified (Agrawal 2007). Research on forests has made great theoretical contributions -especially to the theory of the commons- owing to the attributes they share with other systems and the consequent complexity when studying their dynamics (Ostrom, 199b). Over the past two decades, efforts to better understand forest systems dynamics have increased due to growing recognition of their importance for preserving life. Nevertheless, there is still a lack of recognition of such strategic role (FAO 2014).

Natural resources are embedded in complex dynamic systems that interact in multilevel settings or contexts; the system's components (social and biophysical) interact across temporal and spatial scales (see Ostrom 2007a; Ostrom, 2009a). Complex SESs are composed by diverse subsystems such as the resource system (forests), resource units (e.g. timber) and governance system (rules that govern forestry) that interact with one another, even though they can be relatively separable (Ostrom 2007a). Understanding these interactions has proven to be difficult when the ecological and the social features of a resource are not seen as an integrated and complex system. The complication when studying SESs resides in the interaction of the system's components, since each system is composed of multiple subsystems and is part of larger systems (Wilson 2002; Ostrom 2007a; Bal 2014). Therefore, social and biophysical components of SESs are to be analysed bodily when addressing the governance issue.

Until recent times, conventional theory had suggested that users of Common Pool Resources (CPRs) were not capable of communicating and cooperating, i.e. of self-organizing, which would result in overharvesting, namely in the occurrence of what Hardin calls the tragedy of the commons (1968). The idea of a catastrophic end for CPR that remained as common property made scholars advocate for private property as the most efficient form of property or government ownership and control, assuming regulators would induce socially optimal behaviour. In addition, blueprint models of governance or panaceas were suggested in many



cases. This implies giving simple solutions to complex SESs. (Ostrom, 2007a) However, conventional theory faces the challenge of increasing research demonstrating that community-based governance is often likely to have better outcomes, and that privatization or state-centralized governance models may lead to failure in several cases (Unnikrishnan and Nagendra 2013; Altrichter and Basurto, 2008) and that degradation or collapse of forests ecosystems is more likely to occur when there is open access to the resources and no effective governance has been established (Ostrom, 1999b). Nevertheless, the possibility of occurrence of the tragedy of the commons is not eliminated, in particular when certain attributes that enhance the probability of self-organization are absent. A resource system might then collapse (see Ostrom, 1990; Ostrom, 1999b; Ostrom, 2009).

Nowadays, there exists broad consensus on the multiple successes of communities in managing and governing natural resources systems. It is then imperative to study the interrelation dynamics of the two kinds of complex systems; social and ecological (Ostrom, 2007a; Ostrom, 2009b), as well as the conditions and impacts generated by the diverse and changing settings or contexts in which the systems are embedded (Kiser and Ostrom; 1982; Wyborn, 2014).

In order to address the governance issue, the concept of governance must be defined. The growing literature about natural resources management and governance provides diverse assumptions of how governance can be defined. It is important to point out that there is a significant difference between management and governance, even though the concepts can be easily confused. Management refers more to operational aspects of planning and monitoring (FAO, 2000) while governance is a wider and more complex concept. According to Tucker (2010), governance is the exercise of authority including the processes, acts, and decisions of a group or entity within a given context, as it includes the development and enforcement of institutions or rules of the game. Moreover, environmental governance can be defined as "a constant negotiation of what we know about the world, how we choose to act, and how collective action is mobilized" (Wyborn, 2014:56). Rijke (2012) points out that governance embodies two dimensions, namely: governance as a process and as a structure. The first dimension refers to "the setting, application, and enforcement of the rules of the game" (Kjær, 2014:2) and the structural dimension is related to the institutional design (Rijke, 2012). Under the assumption that management is encompassed in the governance sphere, henceforth we will refer to governance.

The existing gap between science and policy has often led scientists and policy makers to fall into the trap of panaceas or blueprint solutions, thus neglecting the uncertainty and non-linearity that the governance process entails (see Ostrom, 2007b; Rijke, 2012). In this sense, the category of adaptive governance has been developed aiming to include the effects that uncertainty carries. Adaptive governance refers to iterative processes of adjusting governance to achieve better outcomes over time (Rijke, 2012).

Important efforts have been made by scholars on the search of the underlining principles or variables that support successful or effective governance; Ostrom sets forth design principles

that characterize robust systems<sup>1</sup> aim to set guidelines to diagnose and/or achieve robustness. Robust systems can be defined as those that have prevailed and adapted to changes across time by creating and modifying their own rules collectively; in these systems the majority of the eight design principles are to be found (Ostrom, 1990; Ostrom, 1999a; Anderies et al. 2004; Cox et al., 2010).

Wyborn (2014) argues that adaptive governance scholarship; mainly the design principles and diagnostics do not focus on the support of governance that is adaptive to change exploiting existing knowledge, aspirations, and institutions. Thus, in order to harness these factors, a co-productive governance framework is needed. Co-productive governance derives from the concept of co-production, which characterizes the relationship between science, policy and practice as a negotiation among actors, bringing out the contextual influences that shape environmental governance (Wyborn, 2014: 59). Consequently co-productive governance focuses on the interplay among actors, highlighting the importance of the role of the context or settings in which governance processes and structures occur. Thus, when aiming to reduce the gap between science and practice, the co-production approach offers a wide spectrum of possibilities for harnessing complexity and co-producing knowledge for the achievement of better governance outcomes.

From the theoretical discussion presented above, it seems obvious that governance can be better addressed when a co-productive governance approach is used. Accordingly, scientific knowledge and social learning can be exploited to face the complexities of the governance issue, due to the fact that this approach addresses governance as a complex and dynamic process, not as a matter of success and failure. We hold that even though design principles should be taken into account as guidelines for the analysis and diagnostic of institutional design, the co-productive governance approach enhances the spectrum of analysis and inserts thrust, as well as it includes the key role played by the particular contexts in which a SES is immersed. Several theoretical contributions are based on specific case studies (Poteete et al., 2011). The outcomes of the three-year research process in the SESs of Santiago Comaltepec are taken as basis to address the governance issue due to the importance their governance outcomes that have allowed them to the preservation of their forests. Hence, the analysis we present in this document aims to include the factors of institutional design that determine the governance structure of the case study of Santiago Comaltepec and that can be up-scaled to a certain degree when approaching a common framework for systems with similar characteristics, this highlighting the importance of the context. Moreover we include the lessons learned in Comaltepec regarding the possible responses of the system to diverse scenarios in order to co-produce guidelines for better governance outcomes and for facing future challenges, this by harnessing the existing local knowledge.

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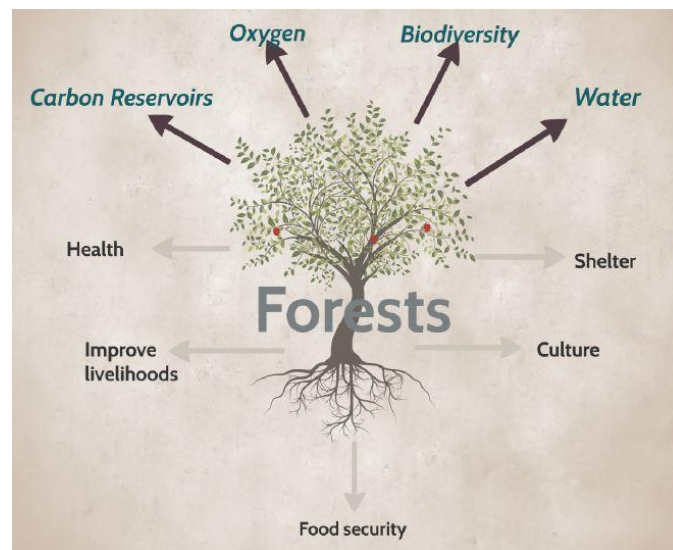
<sup>1</sup> Set of design principles: 1. Clearly defined boundaries, 2. Congruence (between costs and benefits), 3. Collective-choice arrangements, 4. Monitoring, 5. Graduated sanctions, 6. Conflict-resolution mechanisms, 7. Minimal recognition of rights to organize, and for common-pool resources that are part of larger systems; 8. Nested enterprises.

## 2 Forests Governance and the Santiago Comaltepec's Experience

The importance of case studies relies in the fact that problems and potentialities that can affect diverse SESs with similar characteristics can be identified, as well as certain similarities that successful cases share, namely cases that are in institutional equilibrium. Success is strongly related to the capacity communities have had to generate their own operational rules and create institutions that enable them to manage their resources system (Ostrom, 1990:58).

### 2.1 Governance of forest systems

Forests cover 31 per cent of the world's land area and are essential to human survival and for reducing greenhouse effect, as they provide important environmental services because they function as carbon reservoirs and oxygen producers; they actually store more carbon than the atmosphere does (Buizer et al., 2014). Forests also provide humans and other species with shelter, energy, water and socio-economic benefits. According to FAO (2014) wood is the only source of energy in rural areas of less developed countries and also an important source in the developed world; forests play a major role in improving food security, livelihoods and health conditions of poor families, in addition, they are source of employment for millions of people. Culture and biodiversity conservation are also intimately related to forests (WWF, 2014;RRI, 2008).



**Figure 2. Benefits provided by forests systems.**

*Source: authors' elaboration based in (Buizer et al., 2014; WWF, 2014; RRI, 2008).*

Important areas of the world's remaining forests are under the stewardships of local communities and indigenous peoples (RRI, 2014), who exercise legal or official rights to one eighth of the world's total forest area (around 513 million hectares), the vast majority of which (478 million hectares) are located in low- or medium income countries, mostly in natural resources extensive economies (Stevens et al., 2014). Over the past two decades, efforts to better understand forest systems dynamics have increased due to growing recognition in their importance for preserving life, hence over the past two decades and there have been

unfolding efforts to search how to govern forests more sustainably and equitably, nevertheless, such importance has not been sufficiently acknowledged (Tucker, 2009; Agrawal, 2007; FAO, 2014).

Forest governance encompasses processes in which a social system interacts with a forest (ecological) system at different levels or through a multitier of variables across time, with the purpose of ruling and regulating the access rights to the resources and also the resulting benefits, as well as the planning, monitoring and management of the forest system (see Agrawal, 2007; Tucker, 2010; FAO, 2000; FAO 2012). The outcomes of an implemented governance model can be positive or negative, in both, social and ecological aspects; therefore, governance is not only a matter of success or failure, it is, as mentioned above, a complex and dynamic process.

## **2.2 Description of the Case Study Area**

The SES in which the research was carried out by the COMET-LA Mexican team is located in the south of Mexico, in the municipality of Santiago Comaltepec in the State of Oaxaca. The community belongs in the Sierra Juárez region, more specifically a region called La *Chinantla*: a Priority Conservation Area (PCA) (WWF, 2012). One of the main characteristics of the region is the value of its well-preserved forests. Santiago Comaltepec encompasses 18,366 ha of forests under a common property regime and collective governance based on customary practices, which characterizes the governance system of most of the indigenous peoples in the region. In the Comaltepec territory pine-oak and cloud forests predominate whose importance for water catchment on the regional and national levels is cardinal. With altitudes ranging from sea level to 3,000 meters above, the area exhibits considerable variety of biomes. The sightings of the jaguar (*Panthera onca*) denote the role of the well-preserved forests as a shelter for endangered species fleeing from deforestation in nearby areas (Briones et al., 2012). Due to the successful forest management of the Comaltepec community, the cloud forests of Comaltepec are considered among the best-preserved forests in the world (Chapela, 2006).

The reconstruction of historical facts is key to understanding SESs' responses to changing settings and to environmental, socio-economic or political challenges. Our case study, shares with many other successful cases the population's struggle to reconquer their rights over their territory and resources. Comaltepec went through a historic moment when back in the early nineteen eighties, the villagers, in coordination with nearby communities, protested against the natural resources mass destruction (Bray, 1991). After a long legal battle, the community got the federal government to withdraw the concession for wood extraction that it had granted to a paper mill in the 1960s.

## **2.3 Methods and main outcomes of the COMET-LA research process**

The research process carried out by the COMET-LA Mexican team involves a co-production of knowledge aiming to generate locally adapted strategies for the achievement of better governance outcomes. In order to accomplish this goal, first of all, two groups of participants

were selected: internal stakeholders (those who directly influence the SES) and external stakeholders (those who exert indirect influence on the SES).

The SES framework's (see Ostrom, 2007; Ostrom, 2009a; Ostrom, 2009b) set of core subsystems is unfolded in tiers and sub-tiers of variables of second, third or even four levels; the second-level variables are important to understand the system dynamics and responses; accordingly, in the research process in Santiago Comaltepec, fifteen key variables were selected by both groups of stakeholders to carry a Prospective Structural Analysis (PSA) (see COMET-LA deliverable 3.1 and 3.2) in order to analyse the system's current dynamics (see table 1). The role played by the selected variables was characterized as proposed by Ambrosio and Delgado (2008) according to their motricity (influence they exert on the system) and the degree of dependence they have from other variables (see table 1) (for further details see COMET-LA deliverable 3.2). Afterwards, a Scenario Building Process was carried out to study the possible responses of the SES to changes in the settings in which the system is embedded and to future challenges imposed by those changes (see COMET-LA deliverable 3.3).

Table 1. PSA outcomes.

| Selected variables                                   | Stakeholder type   |               |                             |       |
|--|--------------------|---------------|-----------------------------|-------|
|  | External view      | stakeholders' | Internal stakeholders' view | Match |
| <b>More influenced by the settings</b>               |                    |               |                             |       |
| Economic Activities                                  | Result             |               | Result                      | Yes   |
| Migration trends                                     | Secondary          |               | Autonomous                  | No    |
| Type of environmental laws                           | Regulator          |               | Autonomous                  | No    |
| Economic value                                       | Result             |               | Result                      | Yes   |
| <b>Lessinfluenced by the settings</b>                |                    |               |                             |       |
| Monitoring and sanctioning processes                 | Regulators         |               | Secondary                   | No    |
| Livelihoods  | Key                |               | Result                      | No    |
| <i>Non paid activities</i>                           | <i>Determinant</i> |               | Secondary                   | No    |
| Political stability                                  | Regulators         |               | Result                      | No    |
| Extraction and exclusion rights of natural resources | Secondary          |               | Regulators                  | No    |
| <i>Government organizations</i>                      | <i>Determinant</i> |               | <i>Determinant</i>          | Yes   |
| <i>Property rights system</i>                        | <i>Determinant</i> |               | <i>Determinant</i>          | Yes   |
| Collective choice rules                              | Result             |               | Result                      | Yes   |
| Sanitary conditions                                  | Autonomous         |               | Result                      | No    |
| <i>History of use</i>                                | <i>Determinant</i> |               | Key                         | No    |
| Importance (dependence) of resources <sup>2</sup>    | Secondary          |               | Result                      | No    |

Source: authors'elaboration based in COMET-LA deliverable 3.2

The micro-situation in which the communities directly collaborate for resources governance is linked and with a wider context spectrum on the national and international levels. These connexions are as important as the internal ones; that is why a special effort was made to include them in the analysis. To situate the PSA outcomes in a wider framework, we divided

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<sup>2</sup>The importance (dependence) of the resources variable has also attributes that suggest a strong relation with the national and international settings' behaviour. However, it can be argued that these factors' nested attributes can be captured by the *economic activities* variable.

the selected variables into two kinds according to the possible degree of influence they receive from changing settings.

As can be seen from Table 1, in the stakeholders' view, *economic activities* and *economic value* were characterized as results, which means that little influence can be exerted on them. It can be said that these variables are highly determined by the settings. *Migration trends* were not characterized as results; however, their characterization suggests that in this case also little influence can be exerted on them. In addition, it must be said that migration towards the United States of America (main destiny of Comaltepec's migrants) is strongly related to immigration policy and to the behaviour of the labour market in that country.

Regarding the variables that are listed as determinants of the system at least by one of the groups of stakeholders (either internal or external), it can be seen that they are strictly related to the institutions built inside the system according to the customary practices and uses regime by which the system is governed. These variables can be considered as factors of institutional design, and thus as basis for the achievement or maintenance of robustness. Paying attention to these variables is important for the aim of approaching a common framework due to the fact that they represent the solid bases of a system, and their dynamics in a successful case can be up-scaled to a certain degree when trying to analyse institutional change. The determinants in Comaltepec are: *government organizations, property rights system<sup>3</sup>, non-paid activities and history of resources use.*

In the SBP phase, stakeholders and the COMET-LA Mexican team established 11 key factors to take into account for facing five future possible scenarios: (1) *market forces–resource reallocation*, (2) *predominant policy*, (3) *social entrepreneurship*, (4) *sustainable SES*, and (5) *chaotic world*:

- Human capital formation
- Training and advice
- Strengthening links between community and institutions
- Creation of local financial institutions
- New sustainable investment projects based on individual and collective schemes
- Strengthening customary practices and collective memory
- Economic activities diversification and modernization
- Expanding the agricultural sector because of its key role in local economy
- Reviewing and improving development and forest management plans
- Implementing an efficient accountability method in the governance system
- Implementing a payment scheme for *cargos*

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<sup>3</sup>The property rights system is based on federal laws. However, common property regimes are in most cases a characteristic of indigenous peoples managing Common Pool Resources, governed with a customary practices and uses system.

From all the responses that emerged from the SBP, the ones stated by both –external and internal- stakeholders were considered robust responses, these responses are: training and advice, strengthening the links between the community and institutions, and reviewing and improving development and forest management plans. The three of these responses were thought of as measures that should be implemented under any circumstances. For internal stakeholders, Strengthening the customary practices and collective memory was perceived as the basis of the system in any situation, while human capital formation occupies the most important role in the external stakeholders' vision. Since the sustainable SES was the most accepted (by stakeholders) scenario, customary practices and collective memory were considered to be reinforced if the scenario is to be achieved and maintained.

The robustness of the Santiago Comaltepec SES should be evaluated not just in environmental terms, but also by the economic and social performances and the feasibility of positive and sustained outcomes. In that sense, Santiago Comaltepec is worldwide recognized for their well-preserved forests. This success is attributable to several factors: the extraction rate is lower than the forest recovery rate; short and long-term forest management plans, as well as the nature of the governance system ensure an appropriate monitoring process, as well as clear extraction and exclusion rights; culture and collective memory play an important role when determining the people's forest management, avoiding a misuse or abuse of the resource. However, social and economic sustainability present different challenges (see COMET-LA deliverable 3.1 and 3.2).

Even if the social capital stock and the collective memory are fundamental elements in Santiago Comaltepec everyday life, sustainability is not completely ensured in either social or economic branches. For instance, the governance model is based on the cargos system, a scheme that until some months ago used to be founded on the unpaid work of the members in order to cover different roles as key stakeholders (president, secretary, treasurer, topil<sup>4</sup>) in the SES; this fact, in conjunction with the few benefits perceived by the families as a product of the forestry activity, has resulted in much more economic and social pressure, pushing some of the members to migrate in search of better economic opportunities and thus imposing an intergenerational threat to the cargos system, and to the overall governance model. Therefore, even if environmentally speaking the SES can be considered robust, in economic and social terms, the structural unemployment and lack of opportunities might represent a severe threat for the governance system and, consequently, for the long-term performance of the SES.

### **3 Approaching a Common Framework to Achieve Better Governance Outcomes**

Making generalizations of the outcomes from a specific case study that can be applied to any SES is impossible because there are no panaceas, but certainly, the effort of dissecting and harnessing the complexity of an specific SES can be useful to understand the strengths,

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<sup>4</sup> Non-paid activities, that are crucial for the maintenance of the governance system.

weaknesses and challenges that SESs face nowadays, as well as to propose common attributes approaching a common framework for forest governance in systems with similar characteristics.

The influences that SESs receive from the settings with which they interact across time and space are from different kinds (i.e. social, ecological, political, technological or economical). Thus the complexity of addressing the context issue with the complexity that it carries is essential for the study of SESs' governance. When aiming to generate strategies that help to improve or maintain certain governance outcomes, individual actions cannot generate important transformations if they are not combined with specific conditions related to a given context, moreover when including the effects of the context, a learning and adaptive processes are involved. (Kiser and Ostrom, 1982; McGinnis, 2011; Rotmans et al., 2001; Pahl-Wostl, 2007). Hence, aiming to understand the complexity of the challenges imposed by linking macro and micro dynamic situations, we argue that the effects of the settings are a first step for analysing SESs and their role is to be highlighted when applying the SESs' framework (see figure 2). However, the study of the interaction between micro and macro situations that shape the settings' influence on a SES is still a great challenge that scholars face nowadays (Poteete et al. 2011).

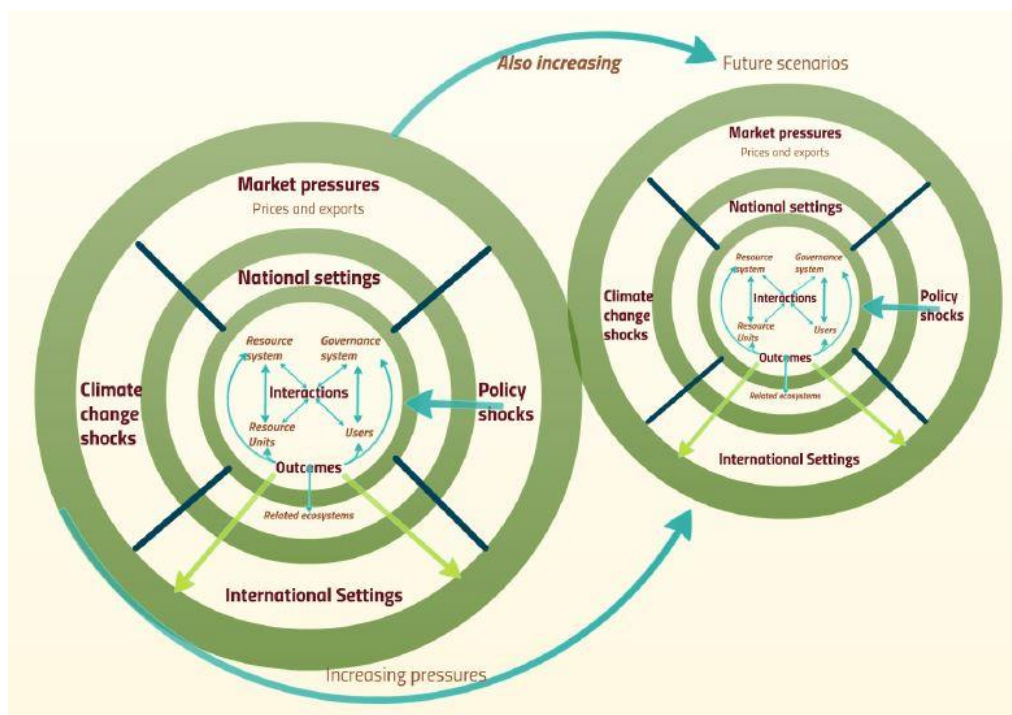


Figure 3. Forests governance dynamics framework.

Source: authors' elaboration based on Ostrom (2009a: 420)

Forests and communities interacting with them will face important future challenges. Some important pressures might be: *ecological* due to the pressures imposed by resources degradation and climate change; *market pressures* related to the fact that the demand of natural resources increases at a higher velocity than resources recovery; *environmental policy*



which can exert positive influence on SESs, but might also fail and impose negative shocks to them.

As Agrawal and Yadama (1997: 435) have stated, "One of the most controversial issues in resource management is the question of how population and market pressures affect resource use". Arnold (1997: 16) analyzes both faces of the market: pressures and opportunities. He notes them as "the more powerful factors affecting control and use mechanisms", but also "the most complex and least understood". Ostrom and Gardner found that "Increasing market pressure leads to increasing anonymity among actors, which lessens mutual dependencies, loosens traditional social ties, and reduces the inter-linkages for possible reprisals in the case of adverse behavior" (Araral, 2009: 689). Even though Agrawal and Yadama (1997) accept the influences of market pressures in forests degradation leading to higher rates of deforestation when local economies are integrated into larger markets, they sustain that once institutions are mediating the resource use, the influence of the pressures is diluted.

As can be seen from figure 2, when the core subsystems are embedded in multilevel settings, the governance issue acquires a global dimension, thus market pressures over ecosystems are likely to an increasing tendency, opportunities might also have such behaviour, however, in the analysed case study, the perception of higher benefits related to market opportunities are low in the community (see COMET-LA deliverable 3.3). The reactions of SESs to the market's behaviour -which has been one of the main outcomes of the PSA- depend on the internal institutions. However, if pressures are too strong, SESs can hardly defend themselves from such shocks, thus, even robust systems can be disrupted.

The phenomenon of climate change has been a source of discussion among scholars. Some authors argue that it has always occurred and will occur in the future due to a variety of factors, not only as a consequence of greenhouse gases emissions (Barros, 2005). Nevertheless, anthropogenic factors that influence climate are also accepted to be part of the effects of climate change (Perillo et al., 2014). Despite the diverse climate change discourses, there exists broad consensus about the fact that the occurrence of global climate change has been increasing, and that its potential effects will depend on geographic location, economic and ecologic conditions of the region, prevention efforts against extreme events, and past investments (Ostrom, 2009c).

Communities can hardly face a challenge as big as climate change by only exerting positive outputs to the multilevel settings. That would be the case even if they accomplish to build and rebuild strong institutions and to achieve the robustness of the variables that determine the system. Positive inflows must exist to protect them from natural resources degradation as well as to influence the existing expected costs-benefits trade-off that determines the decision of resources users to govern them collectively and sustainably. In Santiago Comaltepec, for instance, the importance of the forests' preservation for coping with environmental challenges is recognized; nevertheless, there is a perception of absence of current and future economic benefits. Despite the growing recognition of community-based governance success, it is also important to point out that some community-based governed systems, contrary to Comaltepec, might fail to generate positive environmental outcomes (Fleischman et al., 2014).

Environmental policy at the different levels of settings can exert positive influence on SESs if it is not to fail. Otherwise policies could also have damaging effects. Ostrom & Cox (2010) point out the existing tendency towards private and government' ownership and towards *panacea* solutions as a way to solve environmental problems instead of learning from biological complexity (Ostrom and Cox, 2010). Community-based management experiences often show the little influence of forestry policies, which also shapes perceived benefits and expectations in this regard (García-López, 2013). When policies include unfamiliar strategies and concepts, it is to say that they are not locally adapted, are likely to fail (Bray et al., 2011) due gap between the policy and the real governance arena.

It is difficult to affirm that environmental policies can revert the negative impacts of climate change and market pressures if production processes and economic policies are to preserve their actual tendency. However, it is a more flexible instrument that can mitigate other pressures and can be designed for coping with them in the short, medium and long run. Communities are generally involved in decision-making processes only in a partial way. This can be noticed not only by the passive role communities' play in discussion forums, but also in the official programmes orientated to compensate the income of rural families, making locals less dependent of the resource.

When approaching a common framework for forest governance, the underlining variables that shape institutional design are to be taken in account. In the following table the main implications of the determinant variables of the case study' system are presented.

**Table 2. Determinant Variables**

| <b>Variable</b>                 | <b>Main Implications</b>   |
|---------------------------------|--|
| <b>Government organizations</b> | Participation and autonomy of the decision making process<br>Capacity to create and change rules<br>Conflict resolution arena and mechanisms |
| <b>Property rights system</b>   | Recognition of common property rights by higher authorities (also implies certain degree of autonomy)  |
| <b>Non-paid activities</b>      | Management and monitoring activities Strong links between culture and resources management   |
| <b>History of resources use</b> | Reconquest of rights to govern the CPR<br>Rebuilding of institutions<br>Cultural heritage  |

*Source: Authors' elaboration based on: COMET-LA deliverable 3.2 and Ostrom, 1999b*

Responses to possible scenarios are to be taken into account when aiming to analyse the process of governance and the expectation of changes within the process that community members and scientists can expect. In this respect, the main outcomes of the SBP show that *training and advice, strengthening the links between the community and institutions, and reviewing and improving development and forest management plans* are to be addressed to face future changes and cope with environmental and social challenges. To the forest management plans, *social system's management plans* could be added, this in order to embody them, not only for their study, but also for the governance arena. That would also

contribute to face the social challenges that communities such as Comaltepec face, consequently it could also contribute to achieve or maintain robustness.

Regarding environmental policy, we aim that other elements to be considered when approaching a common framework are the following:

- Acknowledgement of the communities' rights as active stakeholders in the policy-making process given the context of the natural resources, thus securing their rights, not only relying on them the responsibilities of natural resources preservation.
- New policies should also enhance the conjunction between the theory and the practice. Sometimes theorization set practical governance issues aside because of the inherent complexity of the reality (multi-variable processes interacting in a dynamic context).
- By keeping constant the policy characteristics that have already led to a sustainable management of the natural resources, new policies should also be flexible, thus allowing the SES's adaptation to changes suffered in the different tiers of the context in which a SES is embedded.
- New policies should be able to endow communities with capacitation, physical capital, and new tools to improve the decision-making and conflict-resolution processes, in case they are weakened.
- Scientists originated from the community with a natural resource should be supported by this new generation of policies, in order to achieve the practical-theoretical links' strengthening.

#### 4 **Conclusions**

Challenges imposed by biophysical, social and economic changes enhance the relevance of addressing the natural resources' governance issue. In this sense forest systems are now, more than ever, a priority owing to their contributions to human survival, both in social and ecological aspects. It is a major task to protect them and to enhance research efforts to better understand their dynamics. Forests' management and the wider scope that governance encompasses have to be understood, not only as a matter of success or failure, but also as a complex, multilevel and dynamic process. No blueprint solutions can be prescribed to the complex problems confronted by analysing SESs and proposing frameworks and policies that lower the possibilities of degradation.

The complexity of the governance issue is to be harnessed by analysing both dimensions: governance as structure and as a process, moreover, an adaptive governance approach, it is to say an iterative process of governance adjustments is to be considered, this deriving in a broader concept, namely co-productive governance. In this manner the context or settings in which a SES is embedded plays a major role in understanding the governance dimensions. Moreover, combining the factors of institutional design with the key issues of the governance process offers an opportunity to exploit complexity and to set guidelines for achieving better governance outcomes in the communities.

In the aim of establishing a possible common forest governance framework for systems with similar characteristics, the context is to be taken as a first step, this including the influences – positive or negative- it exerts on a given SES. We argue that some important factors shaping settings influences on governance are market pressures, climate change and environmental policy shocks. Nevertheless, there are enormous efforts and contributions to be made, mostly in enhancing the framework's spectrum in order to capture the interactions between micro-situations and macro scales. Solutions to the problems faced by SESs are locally defined, however, a community itself cannot overcome the enormous challenges of external negative influences. Positive external influences have also to be strong inflows. The time horizons are as well a new source of complexity with which it has to be coped. Communities and policymakers need to form expectations of future challenges across the short, medium and long terms. Therefore, possible futures scenarios have to be considered in order to develop adaptive and locally adapted strategies for facing future challenges. Flexibility, in the sense of an iterative process to adapt governance has to be gained without losing the autonomy that allows resources users to create and modify their institutions for governing SESs.

Communities' inclusion as key stakeholders in the research process represents, let there be no doubt, an enormous input to a future approach between theory and practice. Besides, including the civil organizations having strong links with the communities, results in a research process where communities are not only object but also subject of study, influencing and promoting change along the course of the research. Future results must reflect the learning process from previous experiences. Even more, they should try to bridge the gap between environmental and social issues. Evaluation must be done, not only of the success or fail, but also, of the processes and changes. Further research should focus on bridging the gap between the economical and the environmental benefits obtained from the natural resources' governance as it has observed to be one of the main challenges faced by communities. This is especially true for poor communities that do not perceive the benefits from having positive governance outcomes.

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