# Chapter 9
# Payments for Environmental Services: Between Forest Resource Management and Institutional Building


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**Abstract** Environmental services from the perspective of the State have as a public policy objective the conservation of natural environments as well as the coverage of plants that provide environmental services to society, while, from the owners' point of view, decisions on the use of forests, whether through forest extraction activities or the change of land use for agricultural or urban activities, depend on the opportunity costs, the conditions of production, and access to economic resources. This chapter conceptualizes the understanding of environmental services from the economic point of view. The contrast and the workings of the payments for ecosystem services and the community forest management are analyzed; whereas in the last section, it examines the current design of ecological flows to appreciate the environmental services provided by rivers and wetlands. This is exemplified in a case study (Capulalpam de Mendez, Oaxaca). From this perspective, this chapter analyzes the current institutional framework that regulates environmental services such as the recognition of the ecological flow and the payment system for environmental services, emphasizing the contrast with the management of forest resources by forest owners and managers.

**Keywords** Payment for environmental services · Institutional framework · Forest · Ecological flow · Capulalpam de Mendez Oaxaca

## 9.1 Introduction

One of the most important causes of the loss of forest areas and the drying of wetlands around the world is driven by the growth of farming regions and the change in land use for agriculture and livestock purposes (FAO-CONAFOR 2005;

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Aukema et al. 2017). This change involves the loss of services generated by these ecosystems along with their social, environmental, and economic influence; the current biodiversity in those systems and their contribution to the climate change process by reducing the amount of already present carbon sinks (Hernández 2008; Farley and Constanza 2010; UNEP 2011).

The purpose of this chapter is to analyze the current institutional framework that regulates the payment for ecosystem services in contrast to the management of forest resources done by private owners and administrators as well as recognize ecological flows in wetlands around the country as suppliers of environmental services. This chapter will conceptualize the understanding of environmental services from the economic point of view. The contrast and the workings of the payment for ecosystem services and the community forest management will be analyzed; whereas in the last part, the article will examine the current design of ecological flows to appreciate the environmental services provided by rivers and wetlands. This will be exemplified in a case study.

The recognition of the contributions made by ecosystems such as drinking water in urban and rural areas, agriculture, and fishing has evidenced the requirement for enforcing laws that allow governments to maintain the previously stated services. In addition, these laws would provide the owners and administrators (of woods, wetlands, pastures, etc.) with economic incentives so they would avoid changing the land use for activities that pay for their efforts in the short term and that would grant them access to commodities such as clothing and food. The most important instruments generated by the public policy to recognize the importance of the environment and its services are the creation of Natural Protected Areas, a compensation for the Payment for Ecosystem Services, and the establishment of Ecological Flow Regimes in stream banks and aquatic ecosystems.

## 9.2 Environmental Services and Economic Thought

The importance of the functions of forests, wetlands, and natural surroundings in providing the essential ecosystem services for society only highlights the discrepancy between the rationality of social interests and the individual behavior of the agents in that social order.[1]

In other words, the evidence of the continuous loss of forest cover, the desiccation of wetlands, and the land-use change that the country registered (CONABIO 2009) indicate that the sum of all individual behaviors seeking their economic benefit does not move toward a common good.

[1]Mangrove forests provide services at a local level, as a place where several commercial species reproduce; worldwide this carbon fixation rate is three times higher compared to that of other types of forests (UNEP 2011).

This means that an individual gets an individual benefit from a conduct that may impact negatively the common ownership if attached (Hernández 2008; FAO 2009). For example, agriculture provides food and energy, but it is often also associated with considerable negative environmental externalities. Changes in agricultural land-use strategies and production technologies can potentially trigger large (positive or negative) environmental impacts (McNeely and Scherr 2003).

The owner of the resources (forest or wetland) or whoever has the right to enjoy a harmful usufruct (including the change of forest soil or the development of fishing activities toward other uses) internalizes an economic benefit even if this decision has negative consequences for the social context. However, the decision of preserving forests or wetlands in the short term will not make profits for the owner who decides to sacrifice the benefits that would be obtained.

Economic growth in these areas causes environmental degradation and will continue to do so without the creation of effective policies. Many argue that the policies that would change this would be too expensive and that they would slow growth and destroy jobs. However, environmental degradation itself is costly (Hallegatte et al. 2012). Because of this, those who are involved must search for a resolution in which both, economy and environment, can coexist in equilibrium.

If there is no legal and institutional framework responsible for recognizing the ecosystem services provided by the natural surroundings and that warns of the costs of the negative consequences, the owner's incentives will not match the social objectives. In its current configuration, the legal and institutional framework enables the benefits realization at the expense of the common good. "During the deliberations of the United Nations Intergovernmental Forum on Forests, it was agreed that the underlying causes of deforestation and forest degradation are interrelated. The underlying causes include" (FAO 2012):

| | |
|---|---|
| Poverty | Absence of a supportive economic climate that facilitates sustainable forest management |
| Lack of secure land tenure patterns | Illegal trade |
| Inadequate recognition within national laws and jurisdiction of the rights and needs of forest-dependent indigenous and local communities | Lack of capacity |
| Inadequate cross-sectoral policies | Lack of an enabling environment, at both the national and international levels |
| Undervaluation of forest products and ecosystem services | National policies that distort markets and encourage the conversion of forest land to other uses |
| Lack of participation | |
| Lack of good governance | |

The economic incentives offered by the failures in the institutional laws and the unfair exchange conditions are so powerful that the owner or the people with no right over the natural resources continue illegal logging and changing soil use despite having sanctions and the fact that these actions jeopardize the quality of life for this and future generations.

It is worth mentioning that, to understand the payment for ecosystem services (PES), we should avoid certain prejudices such as:

- To compare PES to a strict conversation, when it can be compared to different extractive activities
- To relate PES to the income obtained by a production cycle, when it could be possible to take the net present value (NPV), according to the terms in the PES contracts versus the expected net income in the same period with a looting use
- To compare the PES income to selling products that would not be obtained by means of an alternative use without deducting supply expenses, the workforce, and financing risk of both options
- To relate PES to "doing nothing" since in a country with high deforestation rates, the agreements of the program clearly involve an active forest conservation (Chapela and Lara 2007)

## 9.3 Environmental Services As Public Assets

Environmental services generate public assets from private actions that work in different regions and scales depending on the service we refer to (Heal 2000). The classic definition of public assets where they are defined as assets whose nature determine their non-rival character and for which it is impossible to establish a selective exclusion of their benefits turns out to be inadequate to deal with environmental services and assets (Kelsey et al. 2008; Kelsey 2013). This definition makes us think which economic instruments are likely to design the administrative structure that brings together public assets and market rules while at the same time it will establish organizational limitations.

From the economic perspective, the conservation of the services provided by a natural surrounding is a public asset due to the positive externalities. These allow the society to keep its current quality of life and to maintain the environment productive condition. Rivalry is described as the degree in which the use of goods by an individual reduces the availability to others. Goods such as music being listened in a public square, highways, or information are not rival goods as long as they do not reach a saturation point where every additional user's benefit decreases both the quality and consumption for him and even for the group as a whole. So the rivalry, unlike saturation demand of a limited good and the economic shortage threat, leads the user to guarantee his rights of future access and, thus, to the demand for property rights over the stocks or environmental services (Chomitz et al. 2006).

Excludability is a key element to recognize externality. To confirm the rights of movable property and real estate, alienation is the capacity par excellence, partly because excludability is taken for granted and it distinguishes public from private. Nevertheless, there seems to be a problem when the information asymmetry and the capacities of alienation (or power) are such that it is not possible to guarantee the excludability because of the lack of physical resources to demarcate and protect the

limits of a good or a service (even with a title deed) and the absence of institutional resources to enforce property rights.[2] The problem with excludability has been particularly ascribed to the characteristics of the good or service we are dealing with, if we compare this problem to the physical challenge of excludability due to demarcation and surveillance "To try to solve the distinction between public and private goods." Even though if this classification criterion has been accepted, it would be difficult to find public or isolated goods.

In the best-case scenario, private and public goods are related in such form that optimal functioning of a market of private goods is in itself a public good (Olivera 2007). In this respect, the outcome from those private actions delivers value to society, in a non-rivalrous way, and therefore could be also framed as a public good. The production of the (normally) private goods can also embrace aspects of public goods, for example, where the production of agricultural products or particular agricultural systems and the landscapes they produce are a part of the local identity (Novo et al. 2017).

History and geography demonstrate that any good or service, no matter how intangible it is, can be subject to private appropriation. Unless there are appropriate rules and organizations to guarantee them, any good or service, tangible or personal property, will be difficult to control. The reason is that the organizations responsible for respecting property rights and carrying these laws out are insufficient.

There is a restriction to environmental services (ES) in the markets, and this is the cost of excluding external agents from the benefit flows. Some critics of the payment of ES claim that to demand payment from the users, producers of ES should provide evidence of the relationship between their activities and the provision of these services. Jurists, on the other hand, mention that, in order to talk about the payment for ES. It is necessary that the law recognizes them without taking into consideration the certainties obtained as a result of scientific knowledge, no matter how rich it was (Andaluz-Westreicher 2016).

Jurists argue that formal recognition must precede the contractual agreement. In accordance with this belief based on legal technique, transactions cannot be made on anything that is not considered subject to trade. This means that there must be at least the will to acknowledge the existence of a service coming from the natural resources so we can talk about PES.

The problem of the inexistence of recognizing a good like a subject of rights and exchange (only recognizing it as an externality, intangible, and public good) can now be solved by the explicit recognition of the property rights by one of the parties, enforced by the State and the society. This phenomenon is the result of a simple concurrence of wills, an expression of trust, self-interest, and even certain trust in formal or informal institutions, which guarantee these transactions. The fact that

[2]In Mexico's countryside, the assumed uncertainty in the possession of the land is not caused by the absence of a recognized legal document, but by the inability to guarantee the excludability, establish limits, and mobilize the institutional resources needed to enforce their rights.

these transactions are regularly registered and that they work well implies a bigger social consequence.

The persistence of these transactions and their social sanction has become a great legal phenomenon. The contracting parties and the society as a group believe that a fair act is being performed. From the ethical point of view, remuneration is given in the sense that it should be fair or proportionate. The legal consequence of PES is the confirmation that remuneration is justifiable with the necessary jurisprudence to contribute to casuistry developed, so in this way, we are building the legal framework of PES (Andaluz-Westreicher 2005, 2016).

While environmental goods and services were defined as stocks of infinite flows present in a territory likely to be extended, and whose exploitation did not require rationalization, assignment of property rights, cost internalization, and valuation, it was possible to consider them to be public goods. However, as pressure over these resources was growing, as well as the subsequent perception of a real or potential shortage, and as the nature of production cycle and biological reproduction (in geological cases like oil and fossil aquifers) were known, people became aware of the fact that the constant availability in a permanent way and the inevitable development of the rivalry in their use would be present.

However, the user can still perceive the environmental services as public, non-excludable, and non-rival. Therefore, the excludability or restriction of consumption to future users or beneficiaries depends not only on the physical characteristic of goods but also on the quality of the institutions. Excludability of ES, in some cases, can be carried out through physical barriers (this gets complicated when dealing with services such as "fresh air" or the beauty of a landscape), the efficiency of the excludability will depend on the assignment of property rights and the institutional arrangements for their defense. For these goods and environmental services to be appropriate in a private way, institutions are being built to lay down rules and to guarantee mechanisms that allow making effective the selective excludability or commercialization rights. It is a must to identify that there is indeed something in nature and that the role of goods and environmental services makes us consider them, partially, as public goods.

## 9.4 Case Study: Capulalpam de Mendez

Capulalpam de Mendez is a municipality located in the state of Oaxaca, Mexico, which has been a part of the PES program, with a population of approximately 1300 inhabitants and an irregular surface of 3850 hectares. It is a community that has been promoted as "magic town" due to the condition of its forests which give this place its picturesque aspect, so common in Oaxaca's northern mountain range. Forest goods and services are conceived as non-excludable within and managed by the community in a process to ask for the recognition of the national society for the positive externalities of the local landscape.

Capulalpam de Mendez has a forest that was almost unused until the 1950s. In 1956, it was first given recognition of its value when the lands for wood exploitation were granted concession by the federal government. Despite that, this community was able to get some benefits of the eminent domain and established timber rights on behalf of the licensee and which was managed by the federal government in benefit of the affected communities by the forest exploitation. Since then, the forests have financed the government investment in public services for the communities of this area of the Oaxaca mountain range. In 1981, the decision to renew the forest concession was revoked and the forest became community usage. By doing this, it provided the community with a series of management options that the community had to consider.

In the case of this community, it is limited to collective action problems, which we analyzed in the previous sections of this paper since a good resource management requires an efficient collective action, common goals, and an understanding of their surroundings (forest), regulatory system, and internal surveillance. These actions should be based on economic and sociocultural decisions that restrict and allow decision-making in changing legal frameworks. This community has the support of organizations like the Consejo Regional de Recursos Naturales (Regional Board of Natural Resources) and the Unión Zapoteca Chinanteca (Zapoteca Chinanteca Union) which provides technical forestry services to four forest communities in the area.

Capulalpam de Mendez bases its social organization in a cargo system, understood as a non-paid job of cultural roots which corresponds to the indigenous social structure of this region of the Oaxaca's northern mountain range. To sum up, it is a Zapotec indigenous community where the Comisariado de Bienes Comunales (Communal Goods Commissary) is a lawful effective authority. They know that work is a community service; therefore, the person in charge will need a second job to have an income. Cargo system is based on customs in which the "cargo" (position) lasts between a year and a year and a half. There are two types of cargo: citizens imposed by the citizens' assembly (their responsibilities include to serve the urban area and the municipal services) and the community cargos imposed by the "comuneros" assembly (according to the National Institute of Statistics and Geography, "comuneros" in Mexico are individuals who belong to a rural community and have property rights over lands and can enjoy common goods. They are granted this "comunero" (indigenous farmer) status for being members of the farmer population) who serve the community as a group. Cargos are somehow important in the social and economic life of the community; the positions can go from security guardianship to presidential positions in community institutions like forestry and mining industry, both the citizens and community assemblies consider the economic and family situation of individuals before assigning them a job.

Capulalpam is a multi-active community; it works as a complex production unit with a diversified strategy in the use of their carefully thought out resources to increase family income of the members and the resources of their community.

Among the mentioned strategies, we can find immigrant consignments, forestry and mining work, carpentry, goldsmith, and in a subsidiary way tourist activities, farming, and stockbreeding activities. Since the community administers the utilities generated by such activities, the latter can be transferred to communal enterprises and are considered to fulfill certain communal services such as: religious activities, maintenance of infrastructure facilities, scholarships, and educational trips.

The community and the municipal territory are identical, and the number of domiciles with no rights is so reduced that in practice they operate with an almost perfect complementarity that equals a shared government, where the city council works as a counterpoise to that of the commissary of communal goods and vice versa. In this community, it is possible to observe that enterprises finally have dual purposes by providing jobs and producing economic rents for common use by exploiting natural resources of common property.

The Environmental Services Program for the Capture of Carbon, Biodiversity and Agroforestry Systems (Programa de Servicios Ambientales por Captura de Carbono, Biodiversidad y Sistemas Agroforestales – PSA-CABSA – which is a governmental program created in 2004 as a strategy to promote mechanisms for the payment of environmental services in Mexico) is the biggest step toward the recognition of the community's territory and the reappropriation of the forest. The contract signed with CONAFOR (National Forestry Commission) was created in 2001; one of its functions is to develop and encourage production activities, and preservation and restoration of forests leads us to a recognition of rights that reinforce the role of the community as landlord not only of the forest but also of the environmental services that it produces. This contract forces and at the same time recognizes the work being done to preserve their environment (CONAFOR 2001, 2003).

The payment for environmental services is a rent perceived by natural capital controlled by the assembly. The decision to preserve the forest by guaranteeing the flow of environmental services (ES) is part of the community decisions on the management of their natural patrimony and their product diversification. If the preservation commitments required by the PES are at odds with the exploitation interests of the Empresa Forestal Comunitaria (Community Forest Enterprise) or the requirements in farming, livestock lands, or of other uses, the cost-benefit analysis will be of greater importance in the owner's decision, since the decision would correspond to a potentially more productive asset and not to the rent of an estate highly valued for its option value and its contribution to risk reduction and economic and politic vulnerability.

Even in this case, it is difficult to claim that PES is in itself an instrument capable of inducing a change in the owner's (community) behavior in favor of the preservation of the forest. Since the PES should at least offer a competitive amount compared to the profitability of the forestry exploitation, if what we want is a preservation instrument that modifies the current tendencies in the degradation and deforestation processes, even though a lot of communities claim to be part of the CONAFOR's PES program or similar compensation schemes for environmental services that provide their forest (CONAFOR 2006). The analysis of the Capulalpam case suggests that the income reported by the PES program may not be the

**Table 9.1** Main economic interrelations between institutions, production, and payment of environmental services. 2006. Value added (2006) in Mexican pesos

| Source/ concept | Incomes | Operating cost, investment, devaluation | Operation excess | Community transferences | Investment fund |
|---|---|---|---|---|---|
| Forestry enterprise | 2,766,696 | 2,291,651 | 475,045 | 101,181 | 373,864 |
| Mining enterprise | 2,398,439 | 1,952,466 | 445,993 | 244,463 | 201,530 |
| Forest rights | 344,232 | 0 | | 344,232 | |
| PES | 50,000 | 0 | | 50,000 | |
| Municipal income | 1,708,992 | 1,708,992 | 0 | | |
| Total | 7,268,359 | 5,953,109 | 921,038 | 739,876 | 575,394 |

Sources: Hernández (2008)

determining factor in their decision to preserve the forest, because in the documented case, it represents a lower proportion compared to the incomes from endeavors carried out as a community and certainly does not compete positively with the alternative soil uses.

In Capulalpam, the forest, its preservation and health, is mentioned as a responsibility in the citizen perception of the type of town (understood as the territorial area with a clear assignment of the proportions devoted to the urban, agriculture and livestock, mineral extraction, and forest exploitation) in which they want to live and leave to their offspring. This collective perception of what is desirable turns into the decision to act as a collective individual who does what it takes to lead the general development process in a way that includes the forest preservation.

In this case study, we could identify the isolated elements of an integrated program of PES. The institutional arrangements of the community allow to administer the services within and look for recognition of its benefits outside by means of the PES. However, the voluntary incorporation to the program is accomplished with the subsidy of its other successful activities to the community; in other words, the incomes for other productive activities and the desire to keep the opportunity service of its forests are decisive to the preservation nor are the conditions that the program offers itself (see Table 9.1).

## 9.5 Ecological Flow

Evidence indicates that the dramatic upheaval in the world's ecosystems is due to pressures brought by land-use change, increasing human populations, the pattern of their settlements, and increasing levels of natural resource consumption. These trends also threaten the future human supply of food and water, conditions of quality of life, and survival of other species (Ortega and Ramos 2016). For forests, there is a

consensus that standing natural forests are good at providing clean and relatively stable water flows, yet the impact of tree cover on dry season flows and storm flow protection is highly site specific, asymmetric between forest conservation and reforestation, and sometimes disputed among hydrologists (Ingram and Hong 2011).

As we discussed in the first part of this chapter, a formal recognition from the government and the society is necessary to precede the contractual arrangement that permits to make a payment or compensation for the preservation of environmental services, like the ones provided by ecological flows in aquatic ecosystems and their interrelation to forests preservation. To do this, it is necessary to implement a regulation that recognizes the existence of an environmental service provided for the preservation of natural conditions, as well as a second regulation system that permits the conditions to protect the chosen ecosystem.

That is why in 2004 in Mexico, the National Waters Law was modified to include, among others, the use of national waters for "the ecological protection or environmental use" and, in 2012, the procedure to determine ecological flows in drainage basins was established. This regulation seeks to keep the balance in the natural elements that intervene in the water cycle, and at the same time, it will allow the protection of riparian, aquatic, terrestrial, and coastal ecosystems through a regime of ecological flow in the currents.

This is due to the national problem of the reduction of water in riverbeds, caused by the competition between its uses and the lack of regulation depending on the availability of the resource, for example, the current demand for water in catchment systems in watersheds does not consider the benefits generated by the existence of water in rivers like fishing or forest preservation like mangrove swamps and gallery forests. In this case, subterranean water does not consider groundwater discharge to surface water bodies so affecting an aquifer desiccates natural springs, which protect drinking water services and preservations of habitats in areas away from extraction wells of the aquifer (NMX-AA-159_SCFI-2012).

A way to apply the concept of ecological flow to the instruments of public politics is by guaranteeing water supply in the future by doing a new water use, a use necessary to preserve environmental conditions and the balance of nature (Pfister et al. 2011). Likewise, it permits the management of water resources in a more efficient way so it can face the challenges that supply for human consumption mean and to guarantee supply to present and future generations. It should also be capable of facing environmental challenges like climate change, which demands the protection of watersheds.

It is necessary to reorient water policies that join social and economic policies assuring the social appropriation of the resource, not only as a human activity but also as part of the ecosystem as a whole. It is also important to preserve the services provided by these natural surroundings and provide economic options to owners and administrators of these services which are part of the natural water supply system (woods, wetlands, and meadows) avoiding to change the soil use to economic activities that pay for their efforts in the short term (Rosa et al. 2004).

A viable option to assure the supply of services is by implementing the regulatory methods foreseen in the Mexican Constitution like the preservation of national waters. Water reserve assures the appropriation of water resources for the ecosystem; the objective of the National Waters Reserve is to guarantee the minimum flows for ecological protection, including the preservation or restoration of vital ecosystems associated with the watershed basins. A requisite for achieving this goal is not only the administration of national waters but to bind such administration to the biodiversity that depends on the flow of that basin: this is the creation, protection, and strengthening of protected natural areas near the river's basin we are talking about. Having said that, the proposal is essential to preserve and maintain those areas, some of which are forest areas likely to be granted the provision.

The application of this regulation and the social acknowledgment takes us to the opening discussion on the limitation of private activities in benefit of a common good for society as a whole. In this situation, the regulation is in its early stages compared to the PES' ones, but we can learn from previous experiences when there was an attempt to recognize the environmental services provided by the forest and to include a comprehensive vision of the water cycle and to recognize socially, economically, and legally the compensations and limitations that must be done to owners and administrators of forests and wetlands in the country.

## 9.6 Discussion

Throughout history, deforestation (and other harmful activities) has accompanied economic development. It was primarily in response to deforestation that the concept of sustainable development originated and evolved within the forest (FAO 2012).

In this community (Capulalpam), the CONAFOR'S program for the payment of environmental services is not a determining factor in the owner community's decision to preserve the forest and to continue providing environmental services. The existence of the program and the participation of the community in the announcement did not modify the social or productive conducts since the community strategy of making traditionalist exploitation, improve the forest and keep it for future generations, was a decision made before the PES program.

The acceptance of the payment for environmental services and the decision-making process of the community owner can only be understood by distinguishing the importance of community institution both formal and informal in its economic and social organization, and that grants its restrictions to the economic decision-making process that goes beyond the perception of an immediate economic benefit.

In a context where the loss rate of forest cover is high, in 2004, it was registered a loss of 600,000 ha (Esteva 2004), and it was reduced approximately to 500,000 ha per year (Rosete-Vergés et al. 2014); the existence of nonfragmented and in a good

preservation state forests seems to be associated with an indigenous institutionalism and/or solid community (Esteva 2004), characterized by:

(a) Community status that offers the legal framework for the functioning of efficient management institutions (low transaction costs in a credibility framework of the institutions responsible for enforcing the rules) that effectively coordinate the collective action for the good management of common resources
(b) The existence of access rules which control the access to common resources and that establish performance mechanisms and efficient sanctions
(c) The use of planning tools like the community territory legislation and techniques for the good management of common goods

The existence of well-preserved forest areas may be attributed to one of the following conditions or a combination of them:

(a) Well-preserved forests are mainly located in inaccessible areas where forest exploitation is not profitable, which would be consistent with the minute trip component in the proposal of deforestation risk index of the INE
(b) Community property of forests, particularly those communities where there are strong community institutions, possess a very low discount or negative rate, in spite of being poor communities where there is a high rate of discount compared to their natural resources and which grants a high value to the preservation of the biological resource for future generations
(c) The community territory ordering reveals the opportunity costs of the forest since historically it has been granted high value to the future option that forest resources preservation is a financial option with easy monetization. In the case of an emergency, the community can opt for the extraction of wood for fast sale in the market.

The extension of PES may occur if the schemes manage to demonstrate the growing effects in terms of forest preservation in contrast to the predefined deforestation lines (Wunder 2007) and considering organization aspects of the communities in the management of forest areas.

On the other hand, if the purpose of the policy behind the PES is truly to accomplish long-term conditions in relation to the baseline, which represents the high deforestation rates in Mexico, the intervention would have to focus not only to give a compensation to forests owners but also it should examine policies and encouragement programs, in general, to adjust them to this objective.

Nowadays, the huge offer of sectorial programs that emerged as responses to pressure groups with different points of view, which range
from forest conservation to enhanced living conditions, were translated into the creation of the conditions for the active forest preservation through the reconstruction of community institutionalism and the strengthening of encouragement policies for the promotion of economic activities, including a good forest management. This last, to obtain different kind of products (timber and nontimber) and other income alternatives that would allow generating the basis for guaranteeing the community

reproduction, reducing the forest pressure and complementing the assistance programs for short term might improve the living conditions of the community.

Besides preserving ecosystems, forest conservation allows us to protect the quality and water supply in the fluvial systems and wetlands in general. Therefore, recognizing that the lack of trees in a system generates an absence of water supply in the long term, in other words, failing to acknowledge that the societies living in the area are part of a far more complex and interrelated natural system will develop in a mismanagement of the resources of that area.

## 9.7 Conclusions

The creation of limitation rules of uses (like the ecological flows and the PES in its multiple versions) can be seen as a strategy to preserve them and looks for explicit recognition of the associated costs to preserving the ecosystems provided by environmental services. It also looks for incentive mechanisms that solve the interest divergence between the producers and the users.

As non-developed areas and natural habitats reduce, the previously guaranteed environmental services (in a freeway) are being threatened. These rising shortages make them dangerously marketable to the environmental services.

The existence of several contractual arrangement examples in both developed and developing countries to protect water sources, biological diversity, landscapes, carbon sinks or natural barriers which protect us from natural disasters evidences the idea that a strong economic assessment is not always necessary to calculate the consumer surplus or an opportunity cost study which allows us to calculate the producer surplus.

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