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# PROPOSAL AND LEGAL BASES FOR THE DRAFTING OF A PROGRAM OF PAYMENT FOR ECOSYSTEM SERVICES FOR SONTECOMPAN LAGOON, MEXICO

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## ABSTRACT

In this paper, we are presenting a proposal for the development of a payment for ecosystem services (PES) program for Sontecompan Lagoon, Veracruz, Mexico. We have detailed the several steps to be followed for this proposal, build up hypothetical conservation scenarios, and identified both the beneficiaries and those that must pay for these services. These types of programs do not yet have very clear legal bases for their development, and these bases should be related to the government level (federal, state or municipal) the direct beneficiaries are located at. Another legal issue, which is taken into account and analyzed in this article, is the building of one or several agreements displaying the obligations of the parties. There is a wide range of available options, and the details of the agreement will largely depend on the nature of the parties. PES transactions often involve a single buyer and multiple sellers. Other types of relationships can include a single buyer and seller or a single buyer and several sellers, grouped together by means of a cooperative or another institution that deals with collective issues. In short, this paper proposes an economic environment instrument, the payment for ecological services financed by the private sector, and emphasizes the legal aspects for its proper implementation.

**Keywords:** economic instruments; environmental issue; payment for ecosystem services.

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*PROPUESTA Y BASES JURÍDICAS PARA LA ELABORACIÓN DE UN PROGRAMA DE PAGO POR SERVICIOS AMBIENTALES PARA LA LAGUNA DE SONTECOMPAN, MÉXICO*

*RESUMEN*

*En este trabajo hacemos una propuesta para la elaboración de un programa de pago por servicios ambientales (PSA) para la laguna de Sontecompan, Veracruz, México. Se definen y explica los distintos pasos a seguir para la elaboración de dicho programa, se construyen escenarios hipotéticos de conservación y se identifican, tanto a los beneficiados como a los obligados a pagar por estos servicios. Este tipo de programas todavía no cuentan con unas bases jurídicas muy claras para su desarrollo y éstas deberán estar en relación con el nivel de gobierno (federal, estatal o municipal) en el cual se encuentren los beneficiados directos por los servicios ambientales en cuestión. Otro aspecto jurídico a considerar y que se analiza en este artículo es la celebración de uno o varios contratos que reflejen las obligaciones de las partes. Hay una amplia gama de opciones disponibles y los detalles del contrato dependerán, en gran medida, de la naturaleza de las partes. Las transacciones de PSA a menudo implican un único comprador y múltiples vendedores. Otros tipos de relaciones pueden incluir a un solo comprador y un único vendedor o bien a un solo comprador y varios vendedores, agrupados a través de una cooperativa u otra institución que se ocupe de los problemas colectivos. En definitiva, este trabajo propone un instrumento económico en materia ambiental: pago por servicios ambientales, financiado por el sector privado y subraya los aspectos jurídicos para su correcta puesta en marcha.*

***Palabras clave:*** *instrumentos económicos en material ambiental; pago por servicios ambientales.*

## FOREWORD

Societies derive a wide variety of benefits from ecosystems, known as environmental services, including foods, medicines, building materials, and water we drink or use for different purposes, and that, most often, provide sustenance for both human societies and world economies (FREGOSO et al., 2006, p. 29-46).

Population growth and urban sprawl are some of the factors that, in recent years, have caused a serious environmental impact on mangroves, resulting in air, water and soil pollution. In addition to the above, there was a significant loss of biological diversity, imbalance of natural cycles and change in land use, with side effects such as erosion, salinization and desertification (PEREVOCHTCHIKOVA; OCHOA TAMAYO, 2012).

One of the most pressing current environmental issues is the considerable deterioration of ecosystems worldwide. This loss adversely affects the ability of ecosystems to perform their ecosystem functions and processes related to hydrological regulation, and thus their ability to provide environmental services (PEREVOCHTCHIKOVA; OCHOA TAMAYO, 2012).

In Mexico, it is estimated that approximately 65% of mangroves have been lost and deforestation rate is 5% per year (OLGUÍN et al., 2007, p. 139-154). Because of that, economic incentives such as payment for ecosystem services (PES) have been identified as a possible tool to prevent environmental deterioration, maintain and improve the quality of mangroves, and therefore human life. This initiative aims to reduce and prevent environmental problems through the active participation of beneficiaries and providers of environmental services. PES proposes that landowners or landholders should be compensated for the services they are providing, thus reconciling their interests with those of the society, which they benefit (FREGOSO et al., 2006, p. 29-46). In addition, they are a strategy for natural resource holders, particularly from undeveloped countries, to motivate them to keep ecosystems in good conditions (MARTÍNEZ CRUZ et al., 2010, p. 549-556).

The Ramsar Convention or Wetlands Convention is an “intergovernmental treaty adopted on February 2, 1971 in the Iranian city of Ramsar, located on the shores of the Caspian Sea, which shows the emphasis initially placed on the conservation and the smart use of wetlands, especially as a habitat for such birds” (RAMSAR CONVENTION

SECRETARY, 2013). Ramsar lands are “wetlands that meets a set of criteria laid down to be added to the List of Wetlands of International Importance”. These Criteria are called Criteria of International Importance and were adopted by the Fourth, Sixth and Seventh Meetings of the Conference of the Contracting Parties to the Wetlands Convention (RAMSAR, 1987).

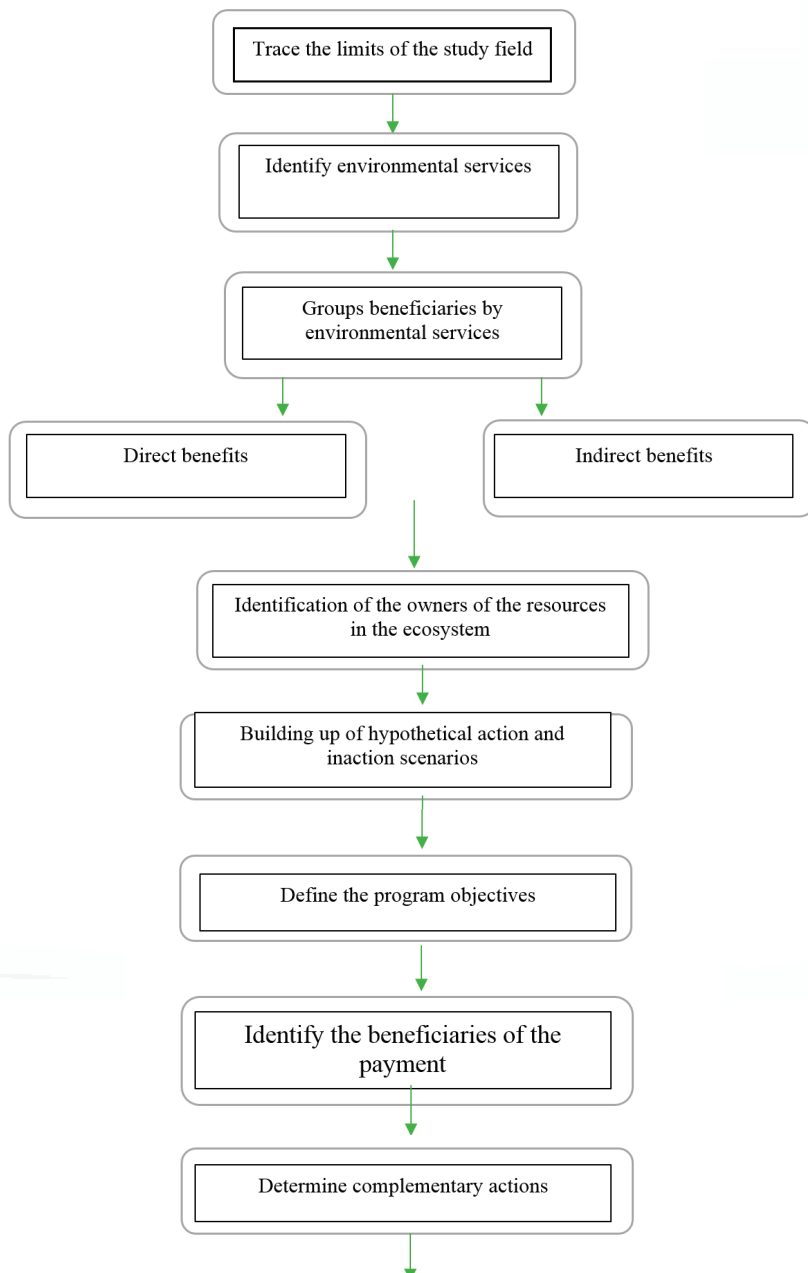
The Ramsar site, named “Mangroves and Wetlands of the Sontecomapan Lagoon”, meets treaty criteria 1, 2, 3, 4, 7 and 8 (ESTEROS, 2003). The first criterion is that a wetland can be considered international “if it contains a rare or unique representative example of a natural or near-natural wetland type found in the appropriate biogeographic region” (RAMSAR, 1971). The wetland of the lagoon includes endangered species such as the black eagle and endangered species such as taiman; thus, it meets the second criterion, which states that the wetland must include these species to be considered of international importance. The third criterion refers to it will be considered as international “if it sustains populations of plant and/or animal species significant to the maintenance of the biological diversity of a given biogeographic region” (RAMSAR, 1971), in this case, in the mangrove. Wetlands provide refuge for thousands of species and thus meet the fourth criterion. The next criterion is the seventh; the area meets the definition for wetland, as it supports a large number of species “that are representative of the benefits and/or values of wetlands, and thus contribute to the biological diversity of the world” (RAMSAR, 1971). The last criterion that meets the definition of wetland is the eighth; it is the fact that it is a food source “or an area for spawning, an area for the development and growth and/or a migratory pathway the existence of fishes depends on, either within or outside the wetland” (RAMSAR, 1971). Nevertheless, the provisions of the Convention do not guarantee a sufficient level of protection for these ecosystems and, therefore, it is necessary to adopt measures, which, in addition to traditional legal rules, should provide effective protection for this ecosystem.

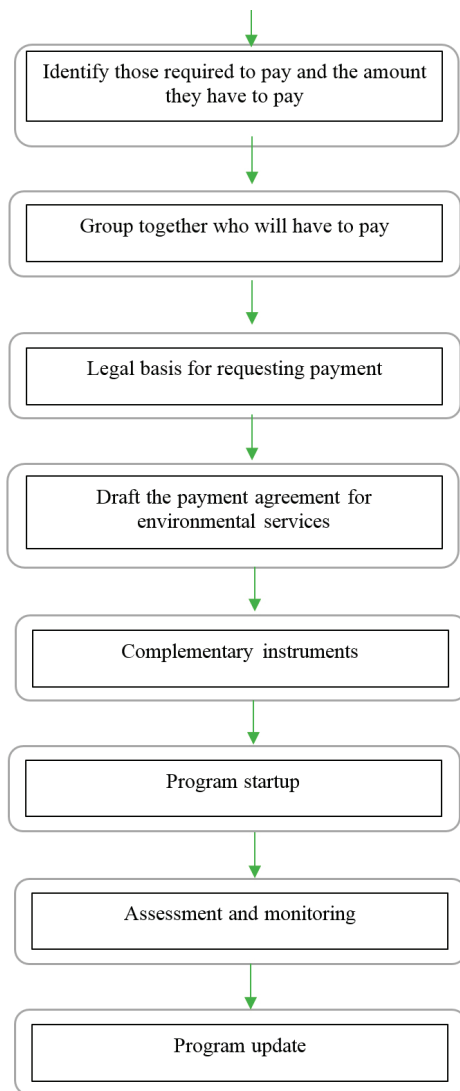
In this article, we propose the elaboration of a payment for ecosystem services program for Sontecomapan Lagoon, Mexico, and attempt a deeper look on the legal aspects that the program should consider.

## **1 OBJECTIVE**

To propose the design of a payment for ecosystem services program for Sontecomapan Lagoon in Mexico, and take a deeper look on the legal aspects that the program should consider.

## 2 METHODOLOGY





For the project of the payment for ecosystem services program, we propose the adoption of the methodology developed by Tania García López: García (2018a, p. 147-165) and García (2018b, p. 41-62), which details the following steps for drafting programs of this kind.

### **3 PROGRAM OF PAYMENT FOR ECOSYSTEM SERVICES FOR SONTECOMAPAN LAGOON, MEXICO**

#### **3.1 Delimitation of the area or ecosystem to be worked on**

##### *3.1.1 Conservation and Restoration Zone*

The area chosen for the conservation and/or restoration actions that are the object of this proposal is the Sontecomapan Lagoon, located in the Papaloapan River watershed. This area is where man-made environmental services are produced, and it shelters a large number of flora and fauna species that need protection, as well as mangroves and wetlands that are of great importance. This lagoon is located in the Tuxtlas region, southeast of the state of Veracruz, 20 km northeast of the city of Catemaco and two hours from the city and port of Veracruz, via federal highway 180 (ESTEROS, 2003).

This is the target area or the area for which the program was designed. This area is home to the most vulnerable resources and also those that provide the largest number of environmental services. It is, in short, the ecosystem that justifies the design of the payment for ecosystem services program (GARCÍA, 2018b, p. 41-62).

##### *3.1.2 Program application area*

The application area is much wider than the previous one, because it is the area that directly influences the lagoon. It covers the entire watershed called the Papaloapan River, which includes 445 municipalities in four states, with a population of 3.3 million (CONAGUA, 2014). There are 161 counties in Oaxaca, 90 in Puebla, 5 in Hidalgo and 189 in Veracruz (SEFIPLAN, 2011).

#### **3.2 Identification of environmental services**

Below there are some important environmental services offered by the lagoon:

- Scenic beauty;
- Protection of diversity;
- Water supply;
- Species breeding and food production;
- Soil protection;

- Carbon capture;
- Erosion control;
- Protection against floods;
- Wastewater treatment; and
- Biological treatment.

### **3.3 Groups benefited by environmental services**

There are a large number of beneficiaries of the ecosystem services provided by the mangroves and the Sontecomapan lagoon: residents of the 6 municipalities and of the surrounding cities of the lagoon, dwellers in the basin municipalities, residents of the state municipalities, and tourists from other states and other countries. Whether directly or indirectly, these groups benefit from the services mentioned below.

It is noteworthy that, as some environmental services directly or indirectly benefit the municipalities facing the lagoon, they also directly or indirectly benefit the municipalities of the Papaloapan River basin, which includes the 445 municipalities that directly influence the lagoon region.

### **3.4 Direct vs. Indirect Benefits**

It is very important to distinguish between direct and indirect benefits,

[...] as it is desirable for environmental services to be paid, at least at first, by direct beneficiaries, although there are others indirectly benefiting from these services. Since these types of schemes permeate a whole society, it would be desirable for all beneficiaries of an ecosystem service to pay for it (GARCÍA, 2018b).

### **3.5 Identification of owners or holders of resources in the ecosystem**

Since the decree of Lázaro Cárdenas dividing Sontecomapan into communal lands and the subsequent government authorization for their sale, the area has gradually changed ownership; “due to the constant modification in private landowners and the lack of physical boundaries for these areas, it is difficult to pinpoint precisely what is the shape of current properties and what surface area they cover” (TOLEDO et al., 1972, p. 199-237). In general, terms, land tenure is broken down into federal, private and communal land, all eminently for cattle raising, but also including activities of harvesting and use of natural resources in nearby forests.



### **3.6 Construction of hypothetical conservation scenarios and their relationship to environmental services**

This program stage focuses on building hypothetical scenarios for conserving the area resources. “It is most advisable to establish them in the medium to long term – 20 to 30 years – a time considered as appropriate to observe changes in an ecosystem with an fitting conservation policy” (GARCÍA, 2018b, p. 41-62).

We propose the establishment of three scenarios and the projection of each one for the mangroves of Sontecomapan Lagoon.

#### *3.6.1 Scenario 1*

We based the first scenario – which we call a pessimistic scenario – was based on a five-year period from 2005 to 2010 when the highest percentage of mangrove loss took place. In 2005, there was a mangrove area of 782 ha, 3% of which was lost during those five years. Thus, in 2010, the mangrove area was 760 ha (These data were taken from the CONABIO characterization chart) (LARA-DOMÍNGUEZ et al., 2009).

This scenario was established with the objective of showing the most extreme scenario that could obtain in Sontecomapan Lagoon within a 20-year period, considering the percentage of loss that took place in previous periods. With this, we would realize the loss that the mangrove would suffer in the period from 2018 to 2038, were the same administration to continue in charge. This scenario assumes that inhabitants with lands within the mangrove would take no action to conserve and/or protect it. Similarly, the inhabitants of the basin and other counties would continue to exploit the resources provided by the lagoon in an uncontrolled manner. Authorities would not be concerned about the future of the lagoon and the mangroves, their possible disappearance compounded by mismanagement. On the contrary, they would continue to exploit the lagoon resources in an uncontrolled manner, and each passing day, logging and deforestation would become increasingly growing threats.

Taking into account the 3% loss from the predetermined period, including mismanagement, in the period from 2018 to 2038 the remaining mangrove area would be approximately 636 ha. These data were obtained by applying a constant loss percentage of 3% for every five years. Therefore, in this pessimistic scenario, there would be a loss of 146 ha. This amount

was calculated by subtracting the 760 ha from the first period from the 636 ha for the estimated period.

### *3.6.2 Scenario 2*

In the second scenario – which we call an intermediate scenario – the predetermined period of twenty-nine years – from 1976 to 2005 – was adopted, showing a moderate 2% loss, resulting in a mangrove area of 782 ha; these data were obtained from the CONABIO characterization chart (LARA-DOMÍNGUEZ et al., 2009). During this period, there was a percentage of 12% mangrove gain due to ecological restoration that year.

In this scenario, Sontecomapan Lagoon is still the same today, the administration is the same, and nothing has been done about it. The inhabitants and tourists who visit it still do not consider the importance of preserving, caring for, and protecting the mangrove.

In this scenario, we considered the percentage loss based on the 2%, which were lost in the 29 years from 1976 to 2005, when there were 782 ha. This loss percentage was calculated by dividing the 2% mangrove loss in period time, yielding a figure 0.06% of the surface area. Taking into account the previously-calculated loss percentage from the predetermined period and maintaining the same administration for the lagoon from 2018 to 2028, we would be left with a mangrove area of approximately 759 ha; data obtained by applying a constant 0.06% of loss per year. Therefore, there would be a loss of 23 ha; we reached this figure by subtracting 759 ha of the estimated period from the 782 ha of the first period, in order to realize the intermediate scenario for the lagoon.

### *3.6.3 Scenario 3*

In the third scenario – which we called an optimistic scenario – the Sontecomapan mangrove is expected to recover. The management will include a payment for ecosystem services program, and there will be a higher level of conservation and control of the environmental services provided by the lagoon. Preserving and protecting the ecosystem with this program would help the lagoon continue to provide these services and even expand them. Uncontrolled exploitation of its resources would stop, logging would decrease and this would cause reforestation in areas that need it, besides conservation actions. Considering that in 2010 the mangrove area

was 760 ha, with the deployment of the payment for ecosystem services program, we would expect the mangrove area in Sontecomapan Lagoon to be maintained by the application of some reforestation measures in some vulnerable areas.

### **3.7 Objectives of the Payment for Ecosystem Services Program**

To properly put together and efficiently deploy the payment for ecosystem services program, after building the hypothetical scenarios, it is necessary, to point out the clear objectives of the program; these must be related to each ecosystem service provided by the lagoon. All of that would be done in order to preserve and protect the ecosystem. At the same time, resources would stop being exploited in an uncontrolled way, thereby reducing logging and significantly stopping deforestation.

All proposed objectives are important for the preparation of payment for ecosystem services, as they help us to carry out actions for the preservation of ecosystem services. For the ecosystem protection service against flooding, the mangrove area must be protected and reforestation actions must be carried out in areas where there is excessive logging. Such actions must be carried out by communal landowners, joint owners and holders, as well as by private property owners.

To reduce wear on soil surface in order to protect it, actions similar to the previous ecosystem service must be carried out by reforesting areas where there has been excessive logging and preserving the soil at an optimum condition. Such actions must be performed by private owners, and communal land joint owners and holders.

It is very important to maintain and preserve the beauty of a place, as well as its biodiversity, in part, so that more tourists keep visiting the place and continue to enjoy the services it provides. To achieve that, more trash bins should be deployed along wharves, trash should be collected periodically in the mangrove area and around the pond and reforestation should continue. Therefore, it is necessary that city halls, residents of the cities/towns, utilities, and fishermen carry out those actions.

Species breeding and food production are vitally important ecosystem services for people. To continue to enjoy these services, measures must be taken in this regard, such as the deployment of non-working periods and the organization of watchdog groups so that they keep an eye in species that need to be protected, as well as regulate their capture. These actions

must be carried out by a joint participation of private owners, communal land joint owners and holders, and the municipal government.

Water is the most important ecosystem service we have and the one we protect the least. It is necessary to raise awareness on its importance, as well as improve the management of this ecosystem service by regulating its use and avoiding dumping waste into the lagoon and contaminating it with other substances. Private owners, communal land joint owners and holders, as well as the municipal government, must carry out such actions.

As we continue to have a kind of biological treatment that retains and processes contained contaminants and keeps producing oxygen and capturing carbon dioxide, we must reforest the mangrove areas that need it the most and periodically analyze water quality, as well as preserve and protect them. Such actions must be carried out by private owners, communal land joint owners and holders, research institutions, universities and utilities.

Finally, there are complementary actions that will be carried out by utilities, city halls, residents of the municipalities, etc., and which are required for the payment for ecosystem services program, even if they do not derive any monetary benefit from it.

Utilities could provide basic actions such as mangrove surveillance and put together programs to help the population learn about the importance of preserving them for ecosystem flood protection, erosion control, diversity protection, soil protection, and oxygen production and capture services.

City halls and the dwellers of the municipalities will carry out complementary environmental service actions, services such as scenic beauty, by placing boats in the mangrove area and periodically collection trash.

Other environmental services where the city hall can carry out complementary actions include species breeding, diversity protection, food production and water supply.

### **3.8 Identification of beneficiaries for payment**

It is necessary to “clearly identify who should benefit from the payment, i.e. who should be paid and why. The beneficiaries of the payment are those who must carry out the prevention, conservation and/or restoration actions necessary to achieve the program objectives” (GARCÍA, 2018b, p. 41-62).

To achieve what is necessary and be able to identify who should

pay and why, in addition to carrying out preservation, conservation and/or restoration actions, “it is convenient to group beneficiaries together by sectors, sorting them by importance; that is, prioritizing those in most vulnerable situation, in other words, those who should be the priority targets of payment. This is one of the central and most complicated aspects of a program of this kind” (GARCÍA, 2018b, p. 41-62).

Beneficiaries of payment for ecosystem services in Sontecomapan Lagoon fall into three groups.

- The first group includes people with mangrove lands in the municipalities near the lagoon, who are divided into communal land owners, communities and land holders;
- The second group is made up of owners, communal land owners, communities and land owners for the protection of the breeding, refuge, biodiversity protection and species feeding zone, which ensure the production of food; and
- The third group is made up of local fishermen.

### **3.9 Definition of Complementary Actions**

Utilities could implement basic actions, such as surveillance of the mangrove, and draft programs for the population to understand the importance of preserving it, as it provides ecosystem services such as flood protection, erosion control, diversity protection, soil protection and oxygen production and CO<sub>2</sub> capture.

Municipal governments and the dwellers of the municipalities will carry out complementary environmental service actions, services such as “scenic beauty”, by placing boats in the mangrove area and periodically collection trash.

Other environmental services where the municipal governments can carry out complementary actions include species breeding, diversity protection, food production and water supply.

### **3.10 Identification of “debtors” to pay and amount of payment**

This step includes determining who should pay for environmental services according to the information on previously detected beneficiary and how much they would have to pay. Assigning monetary values to natural resources, in particular to non-use values, is complicated and also

risky, as all assessment elements are generally unavailable and the entire ecosystem tends to be devalued. Assigning values to direct and indirect uses to ecosystem resources and services is of paramount importance to partially measure the economic benefits derived from these resources (CALDERÓN; ABURTO, 2009, p. 1-6). Indirect use values refer to the benefits that society receives through ecosystem services and habitat functions. Unlike the direct use value, indirect use generally does not require the user's physical access to the natural resource, but the existence of the resource in a good condition. Indirect active use values can be classified into environmental values and ecosystem values. Ecosystem services include effluent filtration, storm protection, and ecosystem functioning as breeding grounds for fishing species. On the other hand, ecosystem values include carbon capture, soil nitrogen fixation and ecosystem self-preservation (SANSUJO RIVERA; WELSH CASAS, 2005, p. 55-68). The economic value of mangroves, including ecosystem services and the products they provide ranges from \$ 200,000 to \$ 900,000 per hectare per year (WELLS, 2006, p. 33).

Considering the Sontecomapan Lagoon includes 760 hectares of mangrove area and assuming the lowest Wells value (2006, p. 33), it would have an economic value of approximately \$ 152,000,000 per hectare.

To determine a fee that city dwellers should pay, the minimum wage in Mexican pesos of \$ 102.68 and a monthly income of \$ 3,121.47 must be taken into account. If the proposed fee were \$ 40 per month for ecosystem services, it would represent only 1.28% of the residents' salary.

To make the information clearer, we should know how many private households are included in the public water grid:

- Catemaco: 10,786 households
- San Andrés Tuxtla: 34,850 households
- Mecayapan: 3,011 households
- Sotepapan: 7,122 households
- Hueyapan de Ocampo: 7,550 households (INEGI, 2010)

Compared to the previous one, we have a total of 63,319 households that, multiplied by the \$ 40, which would be charged monthly on the water bill, gives us a total of \$ 2,532,760; if we multiply the previous figure for the twelve months of the year, we will have the following amount of money:

$$63,319 \text{ homes} \times \$ 40 = \$ 2.53276 \text{ million per month}$$

$$\text{US\$ } 2,532,760 \text{ per month} \times 12 \text{ months} = \text{US\$ } 30,393,120 \text{ per year}$$

On the one hand, the environmental scenic beauty service will be paid, in part, by residents and, on the other hand, by tourists, through voluntary cooperation when they visit.

As there is no specific or approximate count of the number of people visiting the Sontecomapan Lagoon, the open data will be taken from INAH (2018), where there are annual records of national and international tourist visits to all museums and archaeological sites in the state of Veracruz. Last year at the Tuxteco museum, the total number of visitors in the year was 4,158 tourists. The Tres Zapotes museum had a total of 4,244 visiting tourists (INAH, 2018). We can thus calculate the number of tourists that will visit the area per month, and the number that will be included in that group.

$$4,158 \text{ tourists} + 4,244 \text{ tourists} = 8,402 \text{ tourists per year}$$

Assuming each tourist helps with the proposed \$ 50, it is possible to increase the following annual amount:

$$8,402 \text{ tourists per year} \times \$ 50 \text{ contribution} = \$ 420,100 \text{ per year}$$

or, finally, should carbon capture be included in carbon markets, Sontecomapan Lagoon, which has an area of 760 hectares, provides a total carbon capture of 172,520 tons.

If each ton can be sold from \$ 5 to \$ 10, on the basis of the lower value, they would get the following amount of money per year:

$$\begin{aligned} 172,520 \text{ tC} \times 5 \text{ dollars} &= 862,600 \text{ dollars} \\ 862,600 \text{ dollars} \times \$ 19.03 &= \$ 16,415,278.00 \end{aligned}$$

Considering the amount of money that will be raised, the flood protection service alone could be paid in full. Scenic beauty will be partially paid from the remainder of the previous service and, in part, from contributions by tourists; in addition, carbon bonuses would be obtained from the ecosystem oxygen production and CO<sub>2</sub> capture service.

The amount of money available to pay for the above is \$ 47, 228,498 per year.

### **3.11 Who will be responsible for the payment?**

The proposed sectors for the recovery of ecosystem services are as follows:

**Sector 1:** The first sector to be responsible for the payment of ecosystem services will be the 297,535 inhabitants of the municipalities of Catemaco, San Andrés Tuxtla, Mecayapan, Sotepapan and Hueyapan de Ocampo.

These inhabitants of the five municipalities around the Sontecomapan Lagoon benefit directly from most of the environmental services offered by this Ramsar area. The proposal is to make previous residents pay by a monthly fee that will be added to their water bills.

**Sector 2:** The second sector is made up of state, national and international tourists that visit the mangrove zone of the Sontecomapan Lagoon.

The inhabitants of the municipalities and tourists are those who benefit directly from this environmental service. When visiting the region, they enjoy the mangrove ecosystem, which has a high tourist demand, as well as the landscape, vegetation, fauna and the activities that are performed on site. Tourists are the group that will pay for a large portion of this service when visiting the site and offering a voluntary \$ 50 cooperation. Such cooperation may be made or deposited in vessels placed along the boarding area, on the beach, in restaurants, and meeting points for guided tours of the mangroves and lagoons.

Communication campaigns will be put in place, so that people visiting the area can learn about the importance of preserving and maintaining the ecosystem they are visiting in a good condition; they also need to know how important their cooperation is through an appropriate communication campaign. In the campaign, they would be suggested an amount to cooperate with, although the decision on how much to pay per visit is entirely up to them.

**Sector 3:** The third sector is formed by those involved in the carbon market. There are two types of carbon markets: regulated compliance and voluntary markets. The regulated market is used by companies and governments that, by law, have to account for their greenhouse gas (GHG) emissions. It is regulated by mandatory national, regional or international carbon reduction schemes. In the voluntary market, on the other hand, credit trading is carried out on an optional basis. The sizes of the two markets differ markedly (SEEBERG-ELVERFELDT, 2010).



This voluntary system or market operates under specific rules for the development of voluntary reduction bonuses. Credibility is a key aspect in the voluntary carbon market, so the use of known and accepted worldwide standards is essential. In the voluntary market, companies, non-governmental organizations, governments and individuals can acquire carbon credits. Project developers check offsets through independent agents; these verifications are called “Certified Emission Reductions” and can be sold to people or organizations who want to offset their carbon emissions and to companies or individuals who wish to voluntarily reduce the carbon footprint left by their emissions (BARROS ASENJO; IPINZA CARMONA, 2014, p. 39-60).

It is important to point out that the initial objective of this market was not to meet regulations, but only to build a “green image” or Corporate Social Responsibility (CSR), so the rules are simpler and therefore get lower prices. The objective of this market is to reduce emissions, and quality is ensured by stringent technical procedures that are usually developed by CDM-specific standards and methodologies, and internationally accepted verification standards and sustainable development guarantees are applied. In this sense, Sustainable Forest Management (SFM) stamps, and voluntary tools such as FSC21 and CERTFOR22/PECF23, provide an unusual opportunity, as they are accepted by these markets. Voluntary markets accommodate small-scale transactions, where companies want to offset some of their institutional emissions or build a “green image”, and also inform people that they want to offset their emissions through air travel and commuting. In the carbon market, forestry projects are more profitable when working with native than non-native species, as the value of bonds can be \$ 8 to \$ 10 per ton of CO<sub>2</sub>, while non-native bonds are paid half this amount (BARROS ASENJO; IPINZA CARMONA, 2014, p. 39-60).

#### **4 LEGAL BASIS FOR PREPARING A PAYMENT FOR ECOSYSTEM SERVICES PROGRAM**

“The legal bases for the program implementation will necessarily be related to the level of those that will pay for it” (GARCÍA, 2018b, p. 41-62).

In this case, ecosystem services considered in this first part are the protection against floods and scenic beauty; these services would be paid by the inhabitants of municipalities and will be legally grounded in municipal laws.

Payments will be made on a voluntary basis by means of previously established contributions, and an environmental fund will be established.

There are three types of environmental funds: the public one can be established by directly transferring part of the money from the national budget, or indirectly by granting benefits, prerogatives, in-kind contributions or subsidies or through incentives for private donations. On the other hand, private financing is that which comes, in cash or in kind, from the assets of individuals and when both forms coincide simultaneously, the financing is said to be mixed (DE LA CALLE, 2004, p. 21-45).

In this case, a mixed environmental fund will be set up so that it can be fed by both public and private contributions. It is very important to mention that environmental funds are entities through which innovative financing mechanisms are implemented. These mechanisms began to be generalized in the 1990s.

They include trust funds established by special legislation, foundations, trustees by right, and nonprofit organizations. Most environmental funds are managed by boards that include representatives of the host government and non-governmental organizations. We are most interested in trusts, which are agreements where one or more persons, called trusts, transfer present or future property, money or rights from their assets to another person (individual or legal entity), with a fiduciary call to manage or invest the assets for their own benefit or for the benefit of third parties, called who is called a trustee. Assets affected by fideicommissum do not bear the commercial risk of the trustee fideicommissary, as the assets subject to the fideicommissum may not be targeted by none of their creditors or affected by the bankruptcy of either or both (FVSA, 2012). “Its objective is to finance investments in support of conservation and environmental protection, with particular emphasis on activities planned or included in the natural resource management project” (RODRÍGUEZ BECERRA; ESPINOZA, 2002).

Environmental funds have played an important role in ensuring the long-term conservation of biodiversity worldwide through their ability to mobilize significant financial resources. They currently have the potential to drive progress in emerging markets and reward local communities through a range of mechanisms, including the purchase of offset credits or through initial funds for promising projects. Historically, environmental funds have played a very important role in ensuring the long-term conservation of the planet’s biodiversity, thanks to their ability to mobilize large sums

of financial resources. Today, they have the potential to drive payment initiatives for environmental services through a variety of mechanisms (HERBERT et al., 2010).

They will seek to link this proposed payment project for ecosystem services to environmental funds and trusts that are financial instruments “that seek to provide financial resources for the protection and/or restoration of the environment” (GARCÍA, 2017, p. 267), and the economic instruments that are a part of them.

#### **4.1 Payment for ecosystem services agreement**

Since payments for environmental services, whether for biodiversity, carbon sequestration or water purification, imply the obligation to manage land in a certain manner and for a time in exchange for compensation, the parties must enter into some kind of agreement. An effective agreement will ensure that the parties understand their own rights, obligations and risk attributions. Clarity can help reduce the likelihood of conflicts and failures that may occur. The most convenient agreement for water PES will depend on local circumstances. Prior to drawing up specific agreements, a general strategy will need to be developed. The bottom line is that each PES agreement should be framed within a broader project plan to ensure that individual agreements are complementary and support the overall objective (GREIBER, 2010).

Once the overall PES strategy has been established and the project plan has been developed, the first step in drafting individual agreements is to determine the parties to the transaction. There is a wide range of options available and the details of the agreement will largely depend on the nature of the parties. PSA transactions usually involve a single buyer and multiple sellers. Other types of relationships can include a single buyer and seller or a buyer and several sellers, grouped together by means of a cooperative or another institution that deals with collective issues (GREIBER, 2010).

There are, however, important advantages over written and binding agreements that must be considered from the outset. Written agreements record the rights and obligations of the parties, reducing the possibility of misunderstanding regarding the original terms of the agreement. Written agreements also provide a record that can be referenced in case of disagreement. The process of drafting an agreement promotes a better understanding of the nature of the PES and trade agreements. Finally, the

very act of signing a legally binding document can reinforce the importance of the obligations in the document, perhaps reducing the risk of subsequent violations (GREIBER, 2010).

The essence of the agreement is contained in the conditions that lay down the rights and obligations of the seller and the buyer. There they specify the actions each party must undertake to comply with the agreement, as well as the specific claims of one party against the other. The agreement should clearly state the expectations of both the buyer and the seller.

Another important point in any payment agreement is its duration. While subsidized conservation projects may display temporary success, termination of subsidies may result in landlords returning to their previous management practices, to the detriment of the habitat they have retained. From the buyer's point of view, a longer-term contract could therefore be preferable. However, practical considerations such as available funding, policy changes in management, and inflation risk can make the long-term fixed payment structure a hazardous rather than a secure investment (GREIBER, 2010).

## CONCLUSIONS

1. It is possible that by applying for a payment for ecosystem services, the hectares of mangroves in the Sontecomapan Lagoon will be conserved and the inhabitants and all who benefit from the mangroves will become aware of their importance.
2. Sontecomapan Lagoon does not enjoy any specific protection, other than the generic one established by applicable law, to prevent mangrove felling or poaching in the area, despite being a Ramsar space.
3. Through incentives, landowners of mangrove areas can be paid for sustainable management practices on their lands and to better protect and conserve them, while preserving the services offered.
4. With the application of this payment for ecosystem services program, it may be possible to realize the third scenario proposed in this paper, the one called optimistic, capable of recovering hectares of mangroves in Sontecomapan.
5. By applying this program, it will be able pay for the flood protection service, a service that is very important to the inhabitants and whose value and advantages they usually do not realize.
6. Another environmental service that we propose should be paid for is

the scenic beauty, where the direct beneficiaries are the national and international tourists who visit the Sontecomapan mangrove area and are very important for this proposal.

7. The carbon capture service will enter the carbon markets and generate an amount of money that will be used to pay communities, communal landowners, private landowners, fishermen, etc. for the actions they undertake to continue preserving the environmental services provided by the lagoon.
8. This proposal for payment for environmental services produces a number of benefits for, as we would continue to maintain and protect the mangrove area, we also would continue to generate ecosystem services that benefit the basin inhabitants, municipalities, the state, the country, tourists, businesses, fishermen, etc. This will allow for the recovery of mangroves and to bring in more tourists to stimulate local economy.

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