

Technical Article

Institutional arrangements for the implementation of a municipal payment program for water environmental services: study case of São José dos Campos (SP)

Institutional arrangements for implementation of a municipal payment program for water environmental services: case study of Sao José dos Campos (SP)

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SUMMARY

The use of economic instruments as inducers of environmental quality comes gaining global prominence. In the last decade, Brazil has experienced the implementation of Payment for Environmental Services (PSA) programs to promote restoration and conservation of natural resources, with recognized gains environmental. Considering the incipience of using this strategy as a political municipal public, this work was developed with the aim of present the case study of the PSA project being implemented in the municipality of São José dos Campos (SP), in the Ribeirão das Couves microbasin. The realization This research was supported by bibliographical review, documentary analysis and structured interviews, covering since its genesis, in 2010, until the year 2017. Based on the results, it was possible to verify that public agents municipalities avoided efforts during the first five years to acquire knowledge, establish regulatory means, guarantee economic resources, involve social agents affected by this policy, until it was possible start the project. During this period, the institutional arrangement was established, motivated the viability of learning from partner entities and the opportunity to contribution and sharing. The main gains from implementing the project are related to the increase in native vegetation and the improvement of the quality of waters in the microbasin that are used as a source for water supply local public. Among the challenges highlighted by public managers is the lack of human, material and financial resources dedicated to the initiative. Finally, it is highlighted that the learning generated by the project will serve the municipality for the continuity of the program and similar projects.

Keywords: payment for environmental services; São José dos Campos; institutional arrangements.

ABSTRACT

The use of economic instruments as inducers of environmental quality has gained worldwide prominence. In the last decade, Brazil experienced the implementation of Payment for Environmental Services (PES) programs to promote the restoration and conservation of natural resources, with recognized environmental gains. Considering the incipience of the use of this strategy as a municipal public policy, the present work was developed with the purpose of presenting the case study of the PES project in implementation in the municipality of São José dos Campos, in the Couves creek. The accomplishment of this research was subsidized by bibliographical revision, documentary analysis and structured interviews, contemplating from its genesis, in 2010, until 2017. From the results, it was possible to verify that the municipal public agents invited efforts during the first five years to acquire knowledge, to establish regulatory means, to guarantee economic resources, to involve social agents affected by this policy, until it was possible to start the project. During this period the institutional arrangement was established, motivated by the feasibility of learning of the partner entities and the opportunity of contribution and sharing. The main gains from the implementation of the project are related to the increase of native vegetation and the improvement of water quality in the watershed that are used as source for local public supply. Among the challenges highlighted by public managers is the lack of resources: human, material, and financial dedicated to the initiative. Finally, it is highlighted that the learning generated by the project will serve the municipality for the continuity of the program and similar projects.

Keywords: payment for environmental services; São José dos Campos; institutional arrangements.

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INTRODUCTION

At the end of the 1960s, global environmental problems worsened and, as a result, the adoption of more restrictive environmental legislation began to control potentially polluting activities. In this condition, the collection of fees and the setting of penalties

ities to offenders became necessary and introduced the inter-

-direct relationship between the economy and the environment. The ineffectiveness of command and control actions contributed to the emergence of economic instruments to encourage appropriate conduct and to explain the values arising from the environmental services provided by ecosystems (TAVARES; RIBEIRO; LANNA, 1999).

Payment for environmental services (PSA) is an economic instrument for environmental conservation, in which those who benefit from environmental services pay, and those who contribute to the generation and conservation of these services receive for this reason (PAGIOLA; BISHOP; LANDELL-MILLS, 2006). The objective of PSA is to prevent the maintenance or increase the quality of ecosystem services (GODECKE; HUPFFER; CHAVES, 2014). This is accomplished with financial incentives for owners who consider environmental services when making decisions related to planning land occupation, use of water resources and vegetation management (FOLETO; LEITE, 2011).

According to Godecke, Hupffer and Chaves (2014), the form of compensation can include both payment in kind and creation of infrastructure, access to training, granting of land use rights, product certification, among others. Pagiola and Platais (2007) describe an important qualification of PES programs: indirect benefits, which represent externalities. Thus, PSAs would be a way of internalizing externalities, and the consequence of this is the preservation of environmental services as part of economic decisions (WHATELY; HERCOWITZ, 2008).

Payment for environmental services must be greater than the additional benefit for owners resulting from the alternative use of the land and less than the value of the benefit for the user of the service (PAGIOLA, 2008). In PES programs, payment to service providers can be made in two ways: by service users or by a third party, for example, the government (PAGIOLA; PLATAIS, 2007). The first case tends to be more efficient, as users can see if they are receiving the required service and thus guarantee the efficiency of payments; In the case of government financing, the areas tend to be larger, despite the tendency to be less efficient due to the lack of information about the value of the service and verification of the services provided (PAGIOLA; BISHOP; LANDELL-MILLS, 2006).

Initially, PES programs did not foresee the use of public resources or funds, believing that the market itself would absorb this demand between producers and consumers of environmental services.

(GODECKE; HUPFFER; CHAVES, 2014). However, to this day public action is necessary, since the market has not yet recognizes environmental externalities. Among the measures adopted by public authorities to attribute responsibility for externalities is the use of the polluter-pays (PPP) and protector-receiver (PPR) principles, in addition to encouraging the valuation and pricing of environmental goods and services (GODECKE; HUPFFER; CHAVES, 2014).

According to the same author, the PPP consists of the "commandment given to the polluter to internalize in his costs the values resulting from the pollution produced by his activity" and "aims to avoid degradation or the imputation of responsibility for the damages" (GODECKE; HUPFFER; CHAVES, 2014, p. 33). The PPR aims to "reward agents who preserve nature, as a way of encouraging these actions and compensating for possible financial losses resulting from not maximizing the current use of natural resources" (GODECKE; HUPFFER; CHAVES, 2014, p. 33).

On a global scale, Landell-Mills and Porras (2002) identified 287 payment programs for forest services around the world, both in the carbon sequestration program and for the protection of biodiversity, protection of water sources and landscape beauty. Of the 61 cases of PES programs related to the preservation and recovery of watercourses analyzed, 60 to 65% present private sector participation. In these cases, the intermediation function was the responsibility of governments, communities and especially local non-governmental organizations (NGOs) (WHATELY; HERCOWITZ, 2008).

According to Pagiola (2008), PSA has been increasingly used throughout Latin America. Among the examples cited by the author are the case of the water company and energy company of Quito, in Ecuador, which pays for the conservation of basins upstream of the catchment and the case of the public water company of Heredia, in Costa Rica, whose resources for the conservation of basins are obtained by charging a special fee to consumers.

In Brazil, Bill No. 792/2007, relating to PSA, has been pending at the federal level since 2007. However, with the review of the Brazilian Forest Code, through Law No. 12,651/2012, the federal Executive Branch was authorized to establish a program to support and encourage environmental protection, including the PSA with remuneration, monetary or otherwise, to conservation activities and improvement of ecosystems that generate environmental services (BRASIL, 2012).

Until 2006, PSA was not widely used in Brazil, however some initiatives that do not bear this name were already being taken, such as the Plantar Project, from the Prototype Carbon Fund, in Minas Gerais (ASSIS, 2012). The first PSA projects were implemented in small cities in Minas Gerais, mainly associated with local water services (Extrema and Montes Claros) and paved the way for several other states and many non-governmental environmental organizations. Among the first municipalities that

use or have used water PSA, the following can be mentioned: Apucarana (PR), Rio Claro (RJ), Campo Grande (MS), Camboriú (SC), Vitória (ES) and Guaratinguetá (SP) (PAGIOLA, 2008).

Smaller projects, developed by NGOs, financed locally, emerged from 2006 onwards. Among them, the Safe Carbon Program, in São Paulo, and the Monte Pascoal Ecological Corridor stand out.

— Pau-Brasil, in Bahia (PAGIOLA, 2008).

The main federal PES program in Brazil was Protector das Águas, which began in 2006. It is led by the National Water Agency (ANA) and aims to control rural diffuse pollution in river basins of greater importance for urban water supply. The program's objectives refer to the adoption of soil conservation practices; implementation and maintenance of permanent preservation areas (APP); formalization of legal reserve and implementation of environmental sanitation systems (GODECKE; HUPFFER; CHAVES, 2014).

Among the large-scale state PES programs, we can mention: from Amazonas, Bolsa Floresta Program; from Espírito Santo, Programa ProdutorES de Água; of Minas Gerais, Bolsa Verde Program; from São Paulo, Mina d'Água Project; and Santa Catarina (PAGIOLA, 2008).

In 2009, the National Policy was established in the state of São Paulo on Climate Change (Law No. 13,798/2009), and its instruments provided for the development of economic incentives for the maintenance of existing forests and avoided deforestation, voluntary compensation for the planting of trees, the recovery of vegetation -tion and protection of forests. The law also determined the institution of the Forest Remnants Program (PRF), with the objective of promoting the delimitation, demarcation and recovery of riparian forests and other types of forest fragments, and may provide, to achieve its purposes, payment for environmental services to conservationist rural landowners, as well as economic incentives for voluntary policies to reduce deforestation and environmental protection (SÃO PAULO, 2009).

Within the scope of the PRF, the Environment Secretariat established the Mina D'água de PSA Project, in 2010, in the spring protection modality. The project was carried out under the responsibility of the Coordination of Biodiversity and Natural Resources in an integrated manner with the Município VerdeAzul and Mata Ciliar Strategic Environmental Projects, with the Adopt a Spring Project and with the Water Pact. Executed in areas located in public supply sources, the project included actions aimed at protecting springs, with 16 agreements signed with municipalities and 247 producers registered in municipal notices (SÃO PAULO, 2010a; 2010b).

According to the Oikos Institute of Agroecology (2015), the idea of creating a PSA program for the São Paulo section of the Paraíba do Sul river basin began to be discussed within the scope of the Paraíba do Sul River Basins Committee in 2009, during the preparatory meetings for the review of the 2011–2014 Basin Plan. However, the beginning

of studies related to the PSA Água Vale do Paraíba Program only occurred in 2013, with publication in 2015.

The survey of critical and priority areas for the restoration or densification of riparian forests and hilltops, in addition to the characterization and recovery of springs and degraded areas were only made possible in the basin with the allocation of resources from the Integration Committee of the Paraíba do Sul River Hydrographic Basin (CEIVAP) in its 2012 Multi-Year Application Plan (PAP) (CEIVAP, 2012).

To carry out the actions foreseen in the PAP (CEIVAP, 2012), the Paraíba do Sul River Basin Agency (AGEVAP) launched Notice No. 04 in 2014 (SÃO JOSÉ DOS CAMPOS, 2014c), with the objective of selecting PES projects, prepared by municipalities and/or implementing institutions, for forest restoration of degraded areas and forest conservation of forest areas in the river basin. Among those covered by the notice is the municipality of São José dos Campos (SP), which implemented the Municipal PSA-H Program presented here. As it is the only municipality, among the eight executors, with resources resulting from the response to the aforementioned notice, this work was structured to present its history and, thus, answer the following questions:

- What are the paths taken by the municipality to establish a PES program?;
- Who are the actors that mobilize it and for what reasons do they do so?;
- What are the environmental gains from implementing a PES program?;
- What are the main challenges?

The answers to these questions were obtained through bibliographical review, analysis of program documents, made available by the municipal government and its institutional partners, as well as structured interviews with the municipal managers responsible for the program and with members of the Project Management Unit (UGP).

The construction of the payment for environmental services in the municipality of São José dos Campos

The PES Program in the municipality of São José dos Campos had its genesis in the public management of the four-year period 2009–2012, based on the understanding that, even though the local economy is supported by industrial activities, services and localized commerce in the urban area, two thirds of the municipal territory are located in low-productivity rural areas, with a demand for environmental actions. Therefore, representatives from the Environment Secretariat of the Municipality of São José dos Campos (SEMEA) sought to learn about other pioneering and successful PES programs in Brazil, such as Extrema and Guaratinguetá, with the aim of understanding their objectives and evaluating the feasibility of implementation in the territory (CORTEZ, 2017).

Justifying its actions in the growth of demand for water resources throughout the municipality, SEMEA began the construction of the municipal program aimed at valuing ecosystem services related to water production, especially located in watershed areas and protected areas. As a result, the first phase of the program was aimed at rural landowners in the Protected Area

Environmental Protection Agency (APA) of São Francisco Xavier, located in the Conservation of Water Resources (SÃO PAULO, 2008; SÃO JOSÉ DOS CAMPOS, 2010).

In 2010, SEMEA commissioned a technical report regarding the assessment of the state of conservation of the springs and water availability of the Ribeirão das Couves microbasin, located in the triit of Saint Francis Xavier. This report presented the identification of rural properties, the assessment of vegetation cover and land use, the state of conservation of the springs' APPs, a proposal for remuneration, eligibility and prioritization of areas, as well as the costs of implementing the program (SÃO JOSÉ DOS CAMPOS, 2010).

The diagnosis demonstrated that the conservation status of the Couves stream micro-basin was worrying, due to the environmental impacts resulting from agricultural activities carried out in the territory. It is worth noting that the water availability and quality of this microbasin directly impacts the local population, since it is where water is collected for the public supply of the São Francisco Xavier district (SÃO JOSÉ DOS CAMPOS, 2010).

The Ribeirão das Couves microbasin is located in the river sub-basin do Peixe, the main contributor to the Jaguarí reservoir, which in turn belongs to the Paraíba do Sul river basin. The area was established as an APA by the three spheres of government: municipal master plan (Complementary Law nº 306/06/ SJC), APA São Francisco Xavier (Law nº 12.262/02/SP) and APA of the water sources of the Paraíba do Sul hydrographic basin (Decree nº 87.561/82) (SÃO JOSE DOS CAMPOS, 2006; SÃO PAULO, 2002; BRASIL, 1982).

In 2012, the Grupo Boticário Nature Protection Foundation began its participation in the municipal discussion group and provided support to the construction of the institutional arrangement and legal framework, the definition of technical eligibility and prioritization criteria, the elaboration of the methodology for valuation, in addition to contributing with all the know-how already acquired in other projects in the country. The publication of Municipal Law No. 8,703/12, which established the Municipal PSA Program, aimed at rural area owners in the municipality of São José dos Campos, was the regulatory legal framework for the actions then underway (SÃO JOSÉ DOS CAMPOS, 2012).

During this period, the Municipal Plan for Sustainable Rural Development (PDRS) was also being prepared, coordinated by the Municipal Secretariats for Economic Development and Science and Technology and SEMEA and executed by the Institute of Research, Administration and Planning (IPPLAN). The objective of this plan was to subsidize the

elaboration of public policies aimed at local development, in order to guide the actions to be undertaken in the rural area, considering future opportunities and priorities aligned with the identity of this region of the municipality (IPPLAN, 2014).

The PDRS presented a diagnosis of the use and occupation of rural territory in the municipality. To guide management guidelines in this territory, four prospective scenarios were developed, which ranged from maintaining the current scenario to a scenario focused on the environmental dimension. The normative scenario established through participatory workshops encompassed the understanding of the conservation function of springs and the determination of specific public policies to encourage and regulate the topic. Among the guidelines of the aforementioned plan, the incentives for PSA, the promotion of the environmental adequacy of properties and the guidance for rural environmental registration stand out (IPPLAN, 2014).

The São José dos Campos PES Program was designed to protect, conserve and improve the quality and availability of ecosystem services. This is a voluntary adherence program with a formal contract signed between the environmental service provider and SEMEA and other payers who benefit from the service provided (Articles 7 and 8 — Law nº 8,703/12; SÃO JOSÉ DOS CAMPOS, 2012).

In 2013, through Law No. 8,905, the Municipal Ecosystem Services Fund (FMSE) was established, intended to support and promote the PSA (SÃO JOSÉ DOS CAMPOS, 2013a). The fund makes it possible to obtain public and private revenues for the payment of the PSA originating, among others, from the municipal budget, the ecological Tax on the Circulation of Goods and Services (ICMS), income from public investments in the financial market, of resources arising from environmental fines, remuneration and donations from beneficiaries of ecosystem services.

The first phase of the Mais Água Program was registered with the PAP for the period 2014–2017 (SÃO JOSÉ DOS CAMPOS, 2013b).

The regulation of the legislation that established the municipal PSA and the FMSE was carried out in 2014, through municipal decrees nº 16,086/14 and nº 15,922/14, respectively. It was defined that environmental service providers would be selected among those interested, based on eligibility and prioritization criteria, after multi-criteria spatial analysis, so that compliance with the principles of publicity, isonomy and impersonality could be ensured (SÃO JOSÉ DOS CAMPOS, 2014a; 2014b).

In parallel to municipal actions, CEIVAP established the PAP of the Paraíba do Sul River Hydrographic Basin, in December 2012, as a planning action for the purpose of guiding disbursements to be carried out with resources from charging for water use. To apply the resources and execute its components, the Payment Program for Environmental Services was created with a focus on Water Resources (Water PSA). For the execution of PSA actions

Water, in the period between 2014 and 2016, AGEVAP launched a notice in 2014 with the general objective of selecting PSA projects prepared by municipalities and/or executing institutions, in accordance with PSA Hídrico, for forest restoration of up to 420 ha of degraded areas and forest conservation of up to 350 ha of forest areas in the Paraíba do Sul river basin (CEIVAP, 2014).

The feasibility of obtaining resources to carry out the project and the convergence of the criteria for prioritizing proposals, established in the AGEVAP notice, with the characteristics of the chosen area by the municipality — a large percentage of revegetation of APPs, areas relevant to public supply and areas located in buffer zones of conservation units — culminated in the approval of the project forwarded by the municipal public authorities.

In 2015, the public authorities began the implementation of the Municipal Payment Program for Environmental Services, through the pilot project in the Ribeirão das Couves, by launching the notice calling for owners of rural areas located in the microbasin of the Ribeirão das Cabbages for qualification in the project. Among the actions foreseen in the project are:

- Protection of preserved remnants and restoration of native vegetation in priority areas for resource conservation water;
- The restoration of degraded APPs and legal reserve areas;
- The implementation of good agricultural practices for soil conservation in productive areas and maintenance of local roads;
- Encouraging the use of less impactful agricultural practices, based on an agricultural suitability map prepared for the basin;
- Payment to participating rural landowners for the environmental service generated, with values calculated through a study on the valuation of environmental services;
- Monitoring results.

According to the call notice (SÃO JOSÉ DOS CAMPOS, 2015), the selected properties should provide Environmental Services, resulting from practices that result in: conservation of native vegetation in priority areas for the conservation of water resources (water APPs); restoration of native vegetation in priority areas for the conservation of water resources (water APPs); and conservation of native vegetation in other priority areas for the conservation of natural environmental resources (SÃO JOSÉ DOS CAMPOS, 2015).

The diagnosis of the properties originated the baseline used to calculate the PSA payment value. The environmental valuation of the properties was carried out using the methodology of the Oásis Initiative of the Boticário Group Foundation for Nature Protection, with adaptations of the weights and the computed area to the existing resource. Using the tool, a score was determined for each of the properties, depending on their characteristics, and thus identified the

value to be received by the owners, respecting the ceiling remuneration set out in the AGEVAP notice of R\$ 200/ha.

The institutional arrangement of the project pilot from São José dos Campos

The existence of a voluntary collective involved in the discussion of PES, in Brazil and in the municipal basin, it can be understood as one of the drivers behind the constitution of the UGP, shown in Table 1.

The actors were involved in the municipal project at different periods and made efforts of varying intensity over time.

Since its inception, the project has been technically supported by external organizations.

It is worth mentioning that, although the São José dos Campos PSA UGP meetings are open to the public, there is no direct encouragement of social participation. The municipal ordinance formalizing the project's UGP was published in 2017, with the 15 partner entities.

Table 1 presents a summary of the responsibilities of each entity in developing the project.

In 2015, when the pilot project effectively began, new partners were added to the UGP, such as: Companhia de Saneamento Básico do Estado de São Paulo (SABESP), Universidade Estadual Paulista “Júlio de Mesquita Filho” (UNESP), Fundação Florestal — APA SFX, Instituto Oikos de Agroecologia and Instituto de Conservação Ambiental TNC do Brasil. In 2016, the São Francisco Xavier Solidarity Library and the company Geoambiente Sensoriamento Remoto LTDA. they also participated in discussions associated with project monitoring.

The motivators for participation in the municipal project vary between partner entities, but among them the perception of contribution and learning feasibility are the most prominent. Another relevant factor pointed out by UGP members is the intertwining of the actions they carry out with the project's actions. Among the personal motivators of UGP members are the expansion of knowledge, the development of networking and the possibility of working in a network to exchange experiences, but, above all, broad motivators focused on the desire to contribute stood out. with projects aimed at consolidating PSA in the country.

Implementation of the pilot project payment for environmental services in the municipality of São José dos Campos

The Ribeirão das Couves microbasin, shown in Figure 1, has a total area of 774 ha, presents intense drainage, extremely steep slope, geotechnical risks and vulnerability to soil loss (SÃO JOSÉ DOS CAMPOS, 2014c). Of the eight rural properties existing in the microbasin, four signed an agreement to adhere to the conservation modality. For each of the properties that joined the project, the SEMEA technical team prepared the Individual Plan for the project.

Property, with the identification of areas subject to restoration and conservation. Forest restoration actions were planned for three of these properties. The definition of the intervention areas was agreed with the rural landowners who joined the project, depending on the technical and legal criteria raised and the expected and occurring uses.

Property 1 (P1) has 25.01 ha and is located close to the district's water collection point. It is a production property, with a predominance of dairy farming. Around 60% of the area is covered by pasture, and there is a small area of agricultural cultivation. A significant part of the riparian forest of the property's main stream has vegetation (dense rainforest) in medium and advanced stages of regeneration. Around 10 ha of the property are APPs, but in these areas only 47% have native vegetation cover.

The internal springs and those close to the property's borders are degraded, without native vegetation cover, with an abundant presence of exotics (brejo lily, cattail, marsh brachiaria) and subject to trampling by cattle (SEMEA, 2015b).

Property 2 (P2) has beef cattle farming as its predominant economic activity. Of its 156.21 ha, 62% have pasture cover and 48.92 ha are water APPs. Native vegetation, present in around 75% of APPs, is generally in medium and advanced stages of regeneration, in the form of riparian forests that accompany the streams that cross the property. In several stretches, native vegetation continues beyond the APP ranges, especially in sloped areas (SEMEA, 2015c).

Property 3 (P3) has a total area of 112.42 ha. Of these, 27% are located in water APPs, and 12% are occupied by forestry. The main activity is cattle farming, in addition to the cultivation of olive trees and pine reforestation. Native vegetation covers more than 70% of the property, in medium and advanced stages of regeneration, which guarantees the protection of streams and almost all springs within the property. Of this area with dense native vegetation, 67.03 hectares res became, on November 11, 2016, the Private Reserve of Natural Heritage (RPPN) of Deco, approved by the state body.

Table 1 – Responsibilities of the entities of the Project Management Unit in the Payment for Environmental Services project.

Entities								
A-N-A	◆	◆	◆					1
AGEVAP							◆	
ACEVAP				◆	◆			
SABESP							◆	
CATI						◆		
FF – APA São Francisco Xavier								–
Boticário Group Foundation for Nature Protection							◆	3
ICMBio – APA Mananciais do Rio Paraíba do Sul	◆	◆	◆	◆				
Oikos Institute of Agroecology		◆	◆	◆			◆	
ITA – Civil Engineering Division							◆	◆
Secretariat of Urbanism and Sustainability - SJC								4
TNC	◆			◆				◆
UNESP – ICT/SJC	◆	◆	◆				◆	5
WWF Brazil		◆	◆	◆				6

ANA: National Water Agency; AGEVAP: Paraíba do Sul River Basin Agency; ACEVAP: Associação Corredor Ecológico do Vale do Paraíba; SABESP: Basic Sanitation Company of the State of São Paulo; CATI: Comprehensive Technical Assistance Coordination; FF: Fundação Florestal; APA: environmental protection area; ICMBio: Chico Mendes Institute for Biodiversity Conservation; ITA: Aeronautical Technological Institute; SJC: São José dos Campos; TNC: Nature Conservancy of Brazil; UNESP: São Paulo State University "Júlio de Mesquita Filho"; ICT: Institute of Science and Technology; WWF: World Wide Fund for Nature; 1: technical support and training on soil and road conservation; 2: articulation in the Recovery Project for Climate and Biodiversity services in the Southeast Corridor of the Atlantic Forest in Brazil; 3: training to use the PSA calculation and management system and search for ways to perpetuate this PSA model; 4: project executor. Coordinates UGP meetings, participating in Technical Chambers, and acts as Executive Secretariat; 5: rural sanitation; 6: articulation with the actions and strategies of the Atlantic Forest Program and support for the creation of RPPNs. Source: SÃO JOSÉ DOS CAMPOS, 2017.

Only 30% of water APPs do not have native vegetation, due to forestry or small pasture areas. The approved exploration plan, in progress since mid-2017, envisages biological decontamination with the cutting and extraction of exotic pine trees, the standing death of those whose extraction is unfeasible and the planting of native tree seedlings in the explored areas (SEMEA, 2015a) .

Property 4 (P4) is an RPPN called O Primata.

It is a privately owned conservation unit, with the objective of conserving biodiversity, without the occurrence of expropriation or alteration of the rights to use the property. The O Primata reserve was the first RPPN created in the municipality of São José dos Campos, in 2011, and has an area of 352.92 ha. It is on the border with Minas Gerais and concentrates a large continuous portion of the Atlantic Forest and high-altitude fields of the Serra da Mantiqueira, with 57.43 ha within water APPs (SEMEA, 2015d).

Table 1 shows a summary of information relating to the pilot project being implemented. It highlights the high number of native seedlings planned to be planted in the watershed (84,100). The first payment to the owners was made in July 2016.

Monitoring the water quality of the microbasin was proposed through a meta-analysis of the scientific production on the monitoring of PSA-H implemented in Brazil and the requirements established by the National Water Quality Assessment Program (ANA , 2013). Considering the need for acceptance of the indicators by local managers (GALLOPIN, 1996), the proposal was submitted to the PSA technical monitoring chamber, which has representatives from teaching and research institutions — UNESP and Instituto Tecnológico de Aeronáutica (ITA) — from AGEVAP , SEMEA, SABESP and, after approval, the Project Management Unit.

In this monitoring, the four phases highlighted by Pagiola, Bishop and Landell-Mills (2002) were considered and specific monitoring conditions were determined, as shown in Table 2. The baseline of the basin showed that the waters of the river of Couves do not meet the class 1 limits for the *Escherichia coli* parameter (FIORE; BARDINI; NOVAES, 2017). Monitoring of the implementation phase began in January 2017, through a partnership between ITA, UNESP, São José dos Campos City Hall and SABESP.

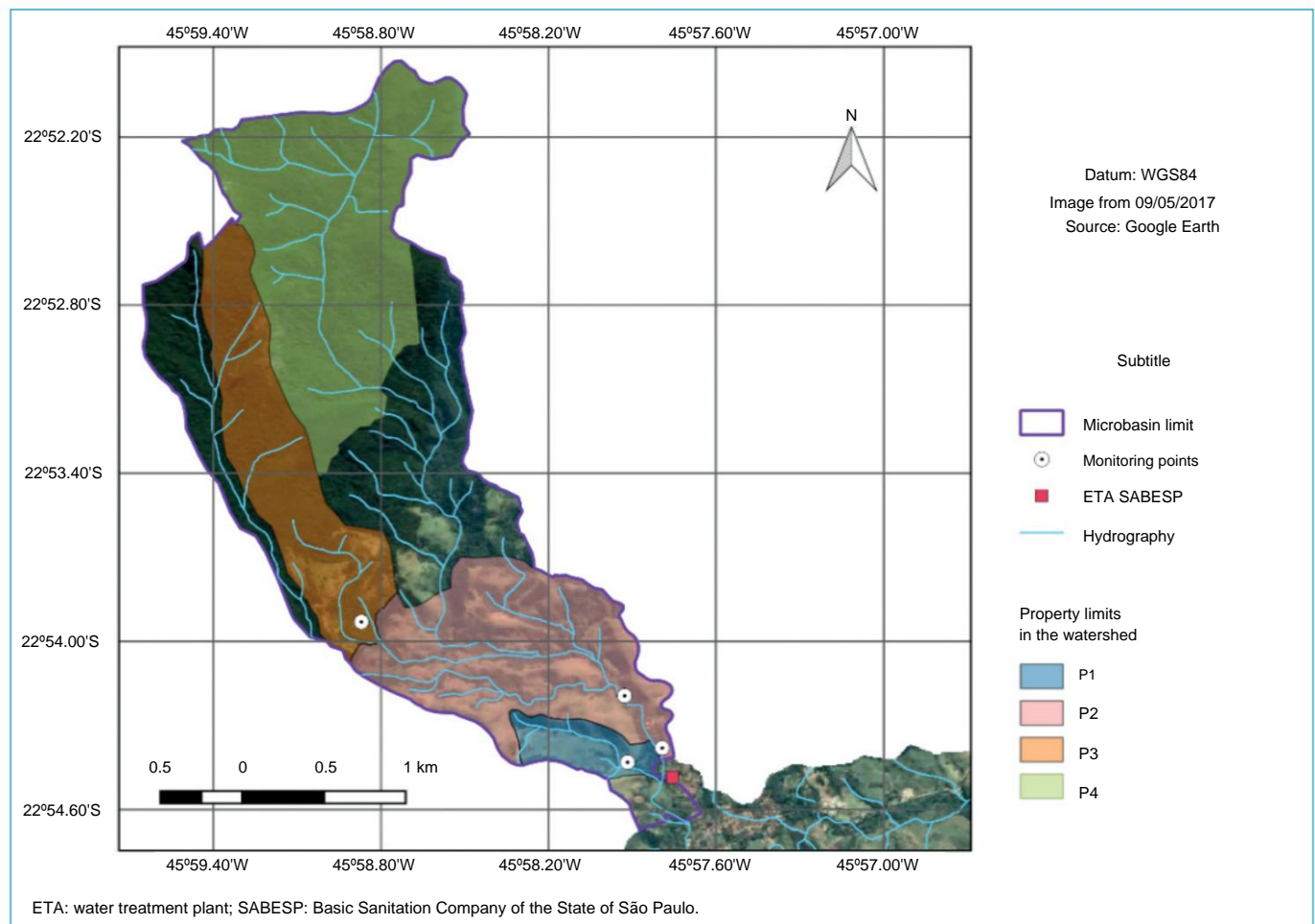


Figure 1 – Rural properties in the Ribeirão das Couves watershed.

Monitoring of the pilot project should not be limited to controlling water quality, but will also include the flow of water bodies, the meteorological conditions of the basin, the success of planting actions and the relationship between providers and users with the environmental service valued. Among the expected environmental gains, the following stand out:

- The increase in the area covered by vegetation, which will contribute to the local microclimate and the infiltration of precipitation, and the consequent increase in biodiversity;
- The increase in water quality due to the minimization of sediment input, after the growth of seedlings;
- The commitment to environmental preservation of these areas, assumed by the producers who joined the program;
- The feasibility of using the area for awareness-raising actions related to water resources management and economic instruments for environmental management.

The challenges of implementing and sustaining payments for environmental services in the municipality of São José dos Campos

According to the Guide for Formulating State and Municipal Public Policies on Payments for Environmental Services (FGB et al., 2017),

the essential elements for the construction of a public PSA policy must be guaranteed by: defining its objectives; creation of the institutional planning, implementation and monitoring arrangement; definition of environmental services and respective providers and beneficiaries; and definition of economic aspects.

Marques and Novaes (2014) state that in the conception of the PSA in the municipality of São José dos Campos there was recognition and the search for the use of the economic incentive instrument as an inducer of conservation processes (and expansion of connectivity) of forest fragments and the environmental suitability of rural production units.

Therefore, its implementation was associated with a broad and diverse set of policies linked to the environmental and rural development agenda in the municipality.

According to Marques and Novaes (2013), the PES project in the Ribeirão das Couves microbasin should serve not only to remunerate owners for conserving, recovering and increasing forested areas in the pilot basin, but also to environmentally adapt properties and enhance the implementation of soil and water conservation practices and support the transition to more sustainable production models.

Local public managers highlight challenges experienced in the planning and implementation phases of the pilot project actions.

Table 1 – Summary of information on Payment for Environmental Services in São José dos Campos.

Project data	Property			
	1	2	3	4
Property area (ha)	25.01	168.58	112.42	352.86
Number of springs	5	12	4	17
Number of streams	4	14	14	18
Initial conservation area (ha)	6.69 (26.75%)	54.93 (35.15%)	79.29 (70.52%)	352.86 (100%)
Number of seedlings to be planted	12,801	70,616	683	-
Number of polygons	3	16	1	-
Final area with native vegetation	14.37 (57.46%)	97.32 (62.27%)	79.70 (70.89%)	352.86 (100%)
Value per hectare	R\$ 124.87	R\$ 135.08	R\$ 166.04	R\$ 196.25
Contract value (2 years)	R\$ 3,588.82	R\$ 12,967.40	R\$ 15,940.25	R\$ 18,840

Source: adapted from CABRAL, 2017.

Table 2 – Water quality monitoring plan for the microbasin.

PSA phases	Sampling point(s) Time (years)		Parameters	Frequency
Preliminary Diagnosis	1*	5	Total coliforms; apparent color; <i>Escherichia coli</i> ; pH; turbidity	monthly
Planning				
Implantation	4*	4	Total coliforms; COD; <i>Escherichia coli</i> ; Nitrogen P; pH; Solids (ST, SV, SST, SSV); Temperature; Turbidity	
Operation	1	4	Total coliforms; apparent color; <i>Escherichia coli</i> ; pH; turbidity	

*See Figure 1; COD: chemical oxygen demand; ST: total solids; SV: volatile solids; TSS: total suspended solids; SSV: volatile suspended solids.

Among them are those related to the need for the existence of a minimum technical staff of public servants dedicated to guaranteeing the preparation of projects, terms of references, draft contracts and notices, fundraising, carrying out field work, project communication and support for actions. Furthermore, they demonstrate difficulties in:

- Obtain data on the rural area of the municipality, at the appropriate scale, from updated hydrographic network, location of native vegetation remnants, quality of fragments, APPs, recharge areas and qualification of rural roads, which makes production and systematization difficult project data;
- Link budget revenues to municipal environmental funds, since most municipalities do not have resources to implement PES programs;
- Implement market mechanisms (raising awareness of environmental services offered to public and private buyers);
- Establish institutional arrangements and partnerships for integrated actions associated with the PSA;
- Carry out extension activities in rural areas to communicate projects and negotiate interventions, since historically municipalities have dealt with these social agents with coercive tools;
- Enable the provision of resources and payments to providers;
- Train the different sectors of public administration on the subject, especially with regard to the transfer of public resources to private individuals and the non-levy of taxes on services;
- Make agile, or adapt to project schedules, the procedures of legal analysis of terms (legal sector), bidding (purchasing sector), contracting (act formalization sector), payment of invoices and deposit of amounts (financial, accounting and treasury sector) to enable execution of projects with external financing resources; these sectors work in the usual time of processes, of daily administration routines, which, in most cases, are far from the deadlines necessary to meet the demands of the financing entity, making accountability and carrying out actions difficult;
- Evidence that the provision of services is carried out by nature (avoiding the collection of tax on services), but that it can only be guaranteed with the commitment of the owner(s) and the applicability of the PPR.

It is worth noting that the challenges faced by local public managers occurred in a municipality that has a technical team with high capacity for planning and carrying out projects and that received advice from institutions with experience in similar projects.

FINAL CONSIDERATIONS

The PES pilot project implemented in the municipality of São José dos Campos can be understood as a success story, as it has met the objectives proposed by the financing agent and is ensuring the expansion of vegetation cover in APPs or areas of high environmental sensitivity microbasin responsible for public supply. However, its real impacts can only be measured over the next few decades. As it is a pilot of the municipal program, it should be studied in depth and serve as a reference for public actions on

the theme.

One of the main challenges highlighted by operators of the project under study is the lack of municipal control of the areas chosen as priorities for project implementation, as well as the restoration methodologies adopted. This is because, in general, fundraising is carried out through notices, which impose specific requirements on the territory that are not always convergent with the demands and realities of the municipalities, making all stages of the project difficult. To increase the viability of success of similar municipal programs, it is important that local planning of priority areas is carried out, through requirements associated with the increase in environmental services provided and also the interest of owners in participating in the projects.

Water PSA involves restoration actions and, therefore, adherence of providers must be associated with counterpart actions that guarantee the quantity and quality of water on the property, such as: maintaining fences in revegetated areas; the adoption of sustainable practices on properties; the implementation of safe solutions for waste and sewage generated on properties. New PES projects being structured in the state of São Paulo already consider this type of counterpart to be a compulsory additionality to the continuity of payment to providers (FINATEC, 2018).

As it is under development, the project is susceptible to political, economic and social uncertainties in the territory of insertion. Currently, part of the public policies linked to the environmental and environmental agenda rural development, established in the Development Plan Sustainable Rural (IPPLAN, 2014), was replaced by actions in the area of rural sanitation and PES, due to the capture of federal resources through public notices.

Economically, the continuity of the PSA program in the municipality of São José dos Campos can be assured due to compliance with the 2016 municipal law, which authorizes the municipal public authority to deposit the amount corresponding to the ecological ICMS in the FMSE . Therefore, it is possible to infer that the pilot project for the Couves stream basin will serve as a basis for advancing the program itself to new areas in the municipality.

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