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USES OF HYDRIC RESOURCES AT THE SOUTH PARAIBA RIVER HYDROGRAPHICAL BASIN

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ABSTRACT

The South Paraiba Valley Consortium (CODIVAP) in a charge of water resources management of southeast region and São José dos Campos (SP/Brazil) Municipal Master Plan provoked socio-environmental effects that analyzed in this paper. Social and environmental indicators were developed in order to monitor CODIVAP actions for both in the context of water resources in the consortium sphere and in the productive inputs of Micro and Small Business (MSB). As additional results were obtained: a) inventory of MSB including account of each segments (industrial, commercial and services), and analyze implementation effects of intercity consortium on water resource use generated by the City Hall; b) a service center implementation within the CODIVAP objectives like as infrastructure services development in accordance of managers perceived needs into the researched MSB (environmental services, information technologies, environmental education and related issues) and c) the diagnose of Master Plan implantation consequences in the municipality even its MSB. In this research the grounded theory method was used.

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INTRODUCTION

Profound changes in the nature of state attributions are occurring. After several decades of coexistence with a state that absorbed much of the responsibility for the provision of public goods and services, there is now a move toward emphasizing the simple regulatory function of the state. It is also necessary to take into account that changes in the role of the state are related to a set of transformations that have agitated the world this century, both in the political and economic scenario, and that are demanding changes in the relationship between states and society. Globalization, the privatization of state-owned enterprises, the formation of regional blocs and the strengthening of local powers radically change the context of the countries' development strategies and in turn require a review of the role of the state. The transformation of the state-provider into a state-regulator brings changes in the standards of generation of public services and in the management of organizations belonging to the Third Sector. The redefinition of the role of the Brazilian state experienced in recent decades has promoted the construction of a new federative arrangement marked by the decentralization of power.

In this perspective, the performance of the municipalities stood out, which, since the promulgation of the Federal Constitution of 1988, has received prominence in the political-institutional scene as they assumed the execution of public policies that were previously in charge of the Union or the States, leaving them to face two challenges: ensuring minimum social welfare conditions for the population and promoting development based on local actions. The municipal protagonism and the action directed to the local development, in the course of the State reform, unveiled managerial features that ended up breaking the classic forms of governmental action importing in the evolution of the relationship between the federative entities. Obligations increased disproportionately to the operational and financial capacity of municipalities. This dilemma worsened in the smaller municipalities, historically resentful of political weight and financial-operational capacity. And in this scenario, the *Intercity consortium* emerges, integrating municipalities to strengthen their local governments.

Theoretical Foundation

The government sector, given its growth, has influenced the stagnation of the state's ability to cope with its traditional core

activities, such as health, security, sanitation, education, transportation, among others.The growth of the state-owned companies took place in a poorly articulated and planned manner, which limited the possibilities of joint strategies, not only among the different federal, state and municipal spheres, but also among direct and indirect administration bodies, thus reducing the effectiveness of macroeconomic policies. Private organizations ofthe Second Sector must act responsibly in their internal and external relationships, in the face of growing demands from customers, suppliers, internal staff and managers, In this context, and occupying spaces created between the First and Second sector, NGOs and other types of social organizations for the generation of public services, in the form of Third Sector, arise.Non-governmental organizations according to Tachizawa (2019) are non-profit private (non-public) entities, legally characterized as associations or foundations. NGOs may focus on: education; health; culture; community; child and adolescent support; volunteering; environment; support for people with disabilities; partnerships with the government; and other categories of performance. The demand generated by organizations belonging to the Third Sector, accordingtoTachizawa (2019), in addition to the private companies that constitute the Second Sector in social activities, should generate new jobs and, mainly, will require qualified professionals to manage such organizations. The generation of public services is no longer an exclusive function of the state, but rather a function of private companies, especially NGOs and other social organizations in the *Third Sector*. The expansion of collective awareness regarding social responsibility and the complexity of the current demands for non-governmental public services that society passes to Second and Third Sector organizations, induce a new position on the part of organizations regarding such issues.

Municipal Consortium

The constitution of a plural public structure, able to face the difficulties that go beyond the rigidity of the competences of each municipality is fundamental and the Intercity public consortium can be an alternative capable of answering the challenges of governance in public spaces. The consortium are legal entities, constituted as a public association or a private non-profit legal entity, formed exclusively by Entities of the Federation and that, for their constitution and performance, must comply with the requirements of Law 11.107/2005 and Decree 6.017/2007. They are intended to establish federative cooperative relationships to achieve objectives of common interest that would hardly be resolved individually or to achieve greater achievements by combining and saving effort and resources. For the fulfillment of its objectives, the public consortium may: a) enter into agreements, contracts, agreements of any nature, receive social or economic aid, contributions and subsidies from other government entities and agencies; b) under the consortium agreement under public law, to promote expropriations and to establish easements under the terms of a declaration of utility or public need, or social interest, carried out by the Government; and c) be hired by the direct or indirect administration of the consortium members, without bidding. The public consortium, with legal personality of public or private law, will observe the rules of public law regarding the bidding, the conclusion of contracts, the rendering of accounts and the admission of personnel, which will be governed by the Consolidation of Labor Laws (CLT). To the contrary, the organization and operation of public consortium shall be governed by the law governing civil associations.

Social and environmental certification: Organizations of all kinds are increasingly concerned with achieving and demonstrating correct environmental performance, in accordance with ISO14000 by controlling the impacts of their activities, products and services on the environment, consistent with their policy and objectives. They thus act within the context of increasingly stringent legislation, the development of economic policies and other measures to adopt environmental protection and the growing concern expressed by stakeholders regarding environmental issues and sustainable development. The overall purpose is to balance environmental protection and pollution prevention with socio-economic needs. It takes into account the provisions of ISO 9001:2000 to increase compatibility between the two standards for the benefit of the user community. There is comprehensive technical correspondence betweenISO 14001:2004 and ISO 9001:2000 and vice versa.

Municipal Master Plan (MMP): Complementary Law No. 040/2008, based on the Constitution of the Republic and the Municipal Organic Law, established the Municipal Master Plan of São José dos Campos and established rules, principles and guidelines for its implementation. The MMP covers the Strategic Environmental Plan, Strategic Economic Development Plan, Strategic Rural Development Plan and related planning instruments (housing, sanitation and the like).
Human development index adapted to the specificities of the reality of the municipalities of the state of São Paulo, in order to analyze the degree of social and economic development. ISR allows for a comprehensive approach and comparison of state territory in three dimensions: wealth; education and longevity. The data set provides public managers and society with elements for government planning, as well as the monitoring of public policies implemented at the local level.
It is noteworthy that the ISR is recognized by the United Nations both for being the first initiative of a legislative house in the construction of an instrument of control and monitoring of development, as well as for the methodology employed. These elements of improving public management outline differences, as the Human Development Index –HDI, is done every 10 years and the ISR is biennial. An instrument to monitor the evolution of the municipalities, ISR works with a number of variables, which allows detailing the information from São Paulo, raising the qualification of the analysis.

METHODOLOGY

The methodological approach analyzed the scenario arising from Law 11.107/2005 (BRASIL, 2019), which created the Intercityconsortium, and which allowed the joining of municipalities to optimize their public management. According to this law, configuration as the Paraíba do Sul Valley Intercity Consortium (CODIVAP), began to operate regional environmental plans for the recovery and preservation of water resources in the municipalities involved and, in particular, in the municipality of São José dos Campos, the focus of this work. Additionally, The Strategic Environmental Plan of the municipality of São José dos Campos (PMSJ, 2006) was instituted to preserve natural resources with fair socio-economic development, aiming at a better quality of life of the local society. This demanded effects on the governance of the municipalities such as in thetownof Registro and,

especially, the micro and small enterprises (MSB) of their jurisdiction. The regulation of the consortium CODIVAP (2019) in the management of water resources in the Paraíba do Sul Valley region and the Municipal Master Plan (PMSJ, 2019) in register, had social and environmental effects worthy of analysis and consequent diagnosis of their effects on MSB, as users of such water resources, belonging to this municipality. The central objective was the development of social and environmental indicators for monitoring CODIVAP actions, both in the context of water resources within the Consortium and in the productive inputs of MSB. The ancillary objectives were defined: a) to inventory the MSB of the municipality of São José (SP/Brazil), taking into account their segment of activity (industrial, commercial and services), and to analyze the effects of the implementation of the Intercity consortium, in the use water as a water resource generated by the City Hall; b) plan the implementation of a service center within the scope of CODIVAP, for the development of infrastructure services, according to the needs perceived by the managers of the surveyed MSB (socio-environmental services, information technologies, environmental education and the like); c) diagnose the consequences of the Master Plan of the municipality of São José dos Campos on its MSB in the industrial, commercial and service segments. The data from the empirical research developed during 2018, and obtained from an inductive perspective, were the basis of the present work.

In this research we used the grounded theory method (Glaser and Strauss, 1967) which is a qualitative research modality that seeks to generate new theories through concepts, categories and properties. The emphasis of grounded theory is learning from the data (interactive and inductive) generated by empirical research, not from an existing theoretical view (deductive). Additionally, the conceptual basis from the theoretical foundation was used. The biggest difference between grounded theory and other qualitative research methods is their specific focus on theory development through a continuous interdependence between data collection and analysis. It is a method that provides a methodological framework often absent in other qualitative approaches without sacrificing flexibility or scientific rigor. Primary data were obtained through interview scripts, initially formulated with a group of managers and micro entrepreneurs. The data collection roadmap was later confirmed and applied to a sample of MSB. Managers from 86 MSB (industry, trade and service organizations) were interviewed with their completed roadmaps during the first half of 2019. And before completion, the MSB in the sample were revisited to confirm and complement the primary data. These three stages of data capture were done recursively and interactively with the analysis stage, as required by the adopted methodology. Registration data from these companies were obtained directly from their corporate websites. Other secondary data were accessed via the Internet from class institutions such as the São José dos Campos Commercial and Industrial Association – ACI, CODIVAP, Department of Water and Power – DWP, and São José dos Campos City Hall for further analysis.

ANALYSIS AND RESULTS

The Administrative Region of São José dos Campos, created in 1983, is the precursor of CODIVAP, with 14 municipalities, with 270.3 thousand people (0.6% of the total of the state).

The public consortium has an official structure in the form of a management committee to manage its activities, composed of: General Assembly - with representation of all consortium entities; Fiscal Council - The Council monitors and oversees the management, accounting, economic or financial operations of the consortium; issues accounts, opinions and budgetary plans to be judged by the General Assembly. It is made up of mayors and, in some cases, also councilors and representatives of civil society; Administrative Council - consisting of 3 (three) mayors of consortium municipalities; Board of Executive Officers - consists of a general manager and / or a chief financial officer according to the complexity and size of the consortium. Both are chosen by the General Assembly.

Survey Data

We sought to analyze the responses of the 91 companies that answered the survey, which corresponded to 33% of responses in relation to the total of 248 pre-selected companies, according to SABESP's (Sanitation Company of the State of São Paulo) consumer list (2019). From this relationship, we randomly selected companies classified into large, medium and small consumer categories. This has allowed us to establish an understanding of the sustainability stage of local economy organizations. Analyzing the primary data collected, it was evidenced that 45.7% of the total of the sample companies that answered the questionnaire are industries, followed by service companies with 31.6% and, complementarily, 22.7% of commercial companies (see graph 2). Microenterprises in the business and service industries stated in their replies that these two activities are often confused. This was the case of carpentry, one of the companies surveyed that claimed to produce and stock parts, while performing custom services. Answers to the questionnaire showed that most of the companies surveyed,34.9%, belong to the range of 0 to 4 employees with employment relationship, followed by 25.1% in the range of 5 to 10 employees.The interval between 61 or more employees were the answers with the lowest rates, totaling 40% of the total of the surveyed companies. Some microenterprises use outsourcing as part of the local handicraft cooperative. The answers about "social and environmental practices that you would like to apply to your company; name one", were summarized in table 1 below.

Table 1. Socio-environmental practices

Practices	Qty.	%
a) recycling of waste (including industrial and frying oil)	1	1.0
b) reduction of water consumption	24	26.5
c) water reuse in the production process	12	13.2
d) recovery and recycling of liquid discharges	1	1.0
e) requirement of suppliers and distributors for environmental preservation	7	7.7
f) rationalization in water consumption	34	37.4
g) rainwater harvesting (roof)	8	8.8
h) sanitary system water reuse	4	4.4
Total	91	100,0

Source: Generated by survey data

These responses summarize investments in future socio-environmental practices (see data in Table 1 and graph 1). The reduction of water consumption (26.5%) and rationalization of water consumption (37.4%) were also signaled in this direction. It was observed that in the evaluation of these expectations of sustainability practices, according the companies surveyed aim to improve social and environmental procedures. As shown, although few MSB have reported

adopting rainwater harvesting as a source of reuse, there is potential that can be unrestrictedly exploited by a significant number of companies that could use this resource to bring about significant improvements in preservation of water resources and mitigation of environmental damage. Similarly, the reuse of sanitary water, although not yet explored, can become an ally for the region's MSB in preserving the quality of the environment, as well as a tool for generating savings on water supply expenses. On the other hand, a significant portion of the MSB managers surveyed favored the recycling of waste, including industrial oil and cooking oil.For the recycling of frying oil, it is suggested that NGOs based in the region do so in accordance with the guidelines and procedures guided by the Water Resources Center, as suggested in this paper.

Sustainability Requirements

According to primary data obtained from the research, it was evidenced sustainable practices that the managers of micro companies of São José dos Campos (SP) would like to apply, can become standard to be observed by the CODIVAP consortium MSB. These practices, with their respective activities, are: Foundry (reduction of foundry sand disposal and new sand consumption); Chemistry (reuse of treated liquid effluents); Graphics (substitution of raw material); Chemistry (reduction of water consumption; elimination of the use of chemicals in cooling towers); Metallurgy: (reuse of oils and emulsions; reduction of water consumption; reduction in volume and toxicity of solid waste generated recycling of cutting,hydraulic and lubricant oils in the metallurgical industry.

improvement of distribution logistics, with reduction of emissions).

Socio-environmental effects: With the questionnaire answers, an ordering of the surveyed companies was established, according to impacts caused on water and social and environmental resources as explained below. And, in this context, the primary data measured in question 5 showed that there is differentiation in sustainable procedures by industry. Based on these data, one can classify such surveyed companies according to water and socio-environmental factor, as Figure 1. The surveyed companies, respondents of the exploratory research, constitute the reference points, scattered along the dotted line (Figure 2), characterizing the companies in industrial, commercial and services (SEBRAE, 2019; PMSJ, 2019). In the vertical (ordered) axis there is the environmental factor (water consumption, less volume of water reuse, mitigated by social and environmental compensation), and in the horizontal axis, there are the CODIVAP companies. As an example of calculating this factor, we have the case of three companies surveyed: quarry; cargo carrier and; dry cleaning.
The quarry, an industrial company that extracts rocks, grinds, benefits and sells them in the form of gravel in its different particle sizes, according to the proposed concept of water-environmental factor, falls under point G (see Figure 2). But given that its truck fleet adopts alternative diesel fuel, thus achieving CO_2 savings, it can be relocated to point F as a promotion for such environmental gain. On the other hand, the transportation company can be seen at point D but, given the environmental gain from the recycling of fuel oil, which returns as biodiesel, as well as the reuse of water in the

Figure 1. Water and socio-environmental factor ad sectors

Water and socio-environmental factor	Sectors
No consumption of water resources and null socio-environmental effects	retail store
Moderate consumption of water resources and low socio-environmental effects	standard gas station
High water resources and medium socio-environmental effects	car wash in gas station
High water resources and medium socio-environmental effects	electric bakery; electric pizza restaurant.
Medium consumption of water resources and high socio-environmental effects	traditional bakery with wood oven; pizza restaurant with wood oven
High consumption of water resources and high socio-environmental effects	metallurgical and tire vulcanizer
Very high consumption of water resources and severe socio-environmental effects	quarry; sand extraction port; cold store, slaughterhouse and tannery

Source: elaborated by the authors

Table 2. Water Sustainability Balance – WSB

INPUTS (sum of values in thousands of Dollar)	COMPENSATION (estimated values of events)
water consumption (liters/m^3) 100 + artesian well water 20 + rainwater harvesting (roof) 10 Subtotal 130 water reuse in the production process(20) recovery and recycling of liquid discharges (10) sanitary water reuse (10) Water/Liquid consumption 90	1. Direct a) waste recycling (industrial and frying oil) b) environmental requirements on suppliers and distributors c) CO2 emission reduction (*) d) water loss 2. Indirect and intangible ISO14000;ISO16000 Reduction in energy consumption and reforestation Technological innovation in rationalizing water use

Source: Authors

Nickel recovery for reuse in galvanic process; reuse of water for steam generation); Glass recycling (water reuse); Beverage factory (reduction of water consumption); Machining (reuse of effluent from machining lathes); Refrigerator repairs (replacement of refrigerant gas in freezers and refrigerators); Laundry (reduction in water consumption in industrial denim laundry; utilization of reused water in textile industrial processes; Hospitality (water reuse, reuse of sanitary system and rainwater harvesting) Transportation (substitution of mineral for vegetal raw materials, use of renewable fuels and

washing system of its truck fleet, it can be promoted to point C of the scale (Figure 2). This, in addition to the replacement of fuel of mineral origin by biodiesel; and to demand that its suppliers adopt the green cause with the use of clean energy and improvement in their production processes, with corresponding CO_2 reduction. In addition to these measures, the use of biogas as an alternative fuel is also relevant for this type of company. As explained above, it can be inferred that the type of business (industrial, services and commercial) is a major factor alongside the consumption of water resources. And considering the type of business (commercial, industrial

and services), it can be decoded as the nature of the company's product as illustrated in the WSB balance sheet example in table 2. This WSB balance would make it possible to analyze the sustainability stage, as illustrated in graph 1, as well as the potential mobility of the company in focus from one stage to another. It would allow a data sheet to be consolidated to gather information on corporate sustainability in the CODIVAP context. An organization, whatever its management style, has socio-environmental "effects", which are differentiated as a result of the economic sector in which it operates. These effects can be represented as "Compensation" (socio-environmental liabilities). This liability arises from the "inputs" consumed in the company's production chain. Therefore, the organization needs to exercise actions in return, in the form of "Compensation" (sum of values). In this case, socio-environmental actions (Compensation) would be the amount of socio-environmental decisions, at the initiative of the company's management, to preserve the productive processes in a sustainable way. It is how much of the productive inputs and management measures needed to continue to produce goods and services that consume and absorb productive resources in the form of raw materials. It would be like being satisfied with the survey of emissions and projections of carbon neutralization by planting tree seedlings. Such socio-environmental diagnosis, coherently with the sustainability analysis factors, can be represented as a BSH balance, as proposed in this paper. The Vale Agribusiness Company (see table 2) has significant water consumption (R$90.000) which means water grade "J" (level 10).

And as compensatory actions there is waste recycling (including industrial and frying oil), environmental requirements to suppliers and distributors and reduction of CO_2 emissions. The water factor in the "Compensated Inputs" comparison could therefore be adjusted from water grade "J" to "I" (factor 9). Between these two factors, a range from 9.1 to 10 may be considered for eventual intermediate adjustment. That is, if EAV company adopts tree planting as a reforestation project, it can be promoted to an intermediate degree 9,9 and so on. In this example, if you add a project to reduce carbon emissions CO_2, you can get a factor 9.8. Such compensatory action, if combined with the commercialization of Clean Development Mechanisms – CDM, can be obtained further adjustment in this intermediate water factor. In conjunction with the CDM there may be excess credit resulting from carbon emission reductions, which may be traded by the company that generated it. This individually or aggregated in the set of organizations that obtained it. This sectoral consolidation could be managed at the CODIVAP consortium level. This balance sheet is issued observing different sustainability approaches for different organizations that, due to their business, suffer different socio-environmental effects. The WSB balance, composed of assets and liabilities, can be structured as a spreadsheet, considering a double entry diagram ("T" model). This shows, on the one hand, the socio-environmental effects generated by the organization (the factors of analysis are quantified, *a priori*, as a liability), and on the other, the sustainability decisions of its management, with the corresponding economic burdens (socio-environmental costs, calculated *a posteriori*, as an asset) to meet the social and environmental demands arising from the characteristics of its production chain. In this view of the socio-environmental balance can be exemplified the situation of a steel industry, type J company, which is an organization of very high socio-environmental effect.

Compensation should mirror compensatory actions, while *Inputs* represent how much consumption the organization has incurred. Water loss according to SABESP (2019) varies from 20 to 30%, relating loss volume divided by the volume produced. In addition to this loss in distribution, water use rationalization can be achieved through technological innovation. From the answers to question 5, it was evidenced that some companies surveyed, such as transport (companies 79 and 80), tourism (company 4) and wholesale trade (company 88), all with potential for CO_2 reduction (factor of influence on volume). require compliance with sustainable practices (see Figure 1). Analyzing these companies, whose answers were incorporated in figure 1, it is evident as a socio-environmental practice, that there is "requirement of suppliers and distributors for environmental preservation".Compliance by their suppliers with minimum CO_2 emission reduction requirements can result in an average CO_2 emission reduction potential of 6%, as follows: a) if suppliers adopt the green cause using clean energy and improving their production processes would reduce CO_2 release by 4%; and b) if the MSE replaces mineral/animal raw material with plant material, it may reduce CO_2 emissions; the use of green fuel in transportation contributes to the fall; c) by using renewable fuels and improving distribution logistics could reduce emissions by 2%; d) technological innovation applied to processes may result in a 3% reduction; e) recycling programs may result in 8% reduction; f) tree planting and reforestation projects as compensatory actions, as suggested in the WSB; and therefore totaling a 33% reduction potential.

The laundry company with dyeing service, with a high water consumption, even with deduction of the reuse of this water resource, is positioned at point F. However, as it uses laser beam to discolor its ordered jeans, whose characteristic is a marked additional water consumption. can be promoted to point E. Another example is the gas station with car wash service. Washing the car in a car wash consumes 250 liters of water. This volume is up to five times higher than a child's daily spending in a day care center. So that citizens, consumers and entrepreneurs are aware of the importance of rational use of water, the Federation of Commerce of Goods, Services and Tourism of the State of São Paulo (Fecomércio/SP) decidedtolaunch a booklet on the subject. Such economic activity has a water consumption divided by the number of vehicles of 250 liters. Such a metric and the rest of these examples are explained in the following topic. These CO_2 emission reduction data are based on the four transport companies surveyed, whose results from the application of the questionnaire to the transport company managers, asking about the CO_2 reduction potential, whose average opinion (potential reduction) can be consolidated as shown in Table 2.

Technological innovation, although with a reduction potential of 3%, can be expanded to values up to 10%, as is the case with the use of "precision irrigation" in the agribusiness segment. According to research data, there is an average CO_2 reduction potential of 33%. On the other hand, a significant portion of the MSB managers surveyed favored the recycling of waste, including industrial oil and cooking oil. To understand methodologically the proposed classification of organizations in terms of sustainability, it was initially considered a simple classification (industrial, commercial and service organizations), to later adopt an expanded typology of organizations that are interconnected in the Brazilian business environment. Companies in the industrial sector included

organizations related to the steel industry, cement, paper and pulp, metalworking, metallurgy, automotive, and the like (durable and consumer goods). They are those companies that transform productive inputs (raw materials in general) into finished products. As service providers, financial services providers (banks, funding agencies, brokers, insurance companies), engineering, advertising, hospitals, hotels and the like were included. And, as commercial companies, we considered those dedicated to the wholesale and retail business (commercial stores, distributors and related). These industrial, commercial and service companies were grouped in ten degrees, consistent with their water and social and environmental factor, as shown in Figure 2. These grades from A to J are not watertight or linear and can be more flexible according to the individual situation of each company. In this sense, the Balance of Water Sustainability – BSH, is fundamental in the process of framing and mobility of the company by the water and social and environmental degrees/factors. That is, companies, after being allocated to a certain degree, can be relocated by factor based on subsequent assessments of their WSB. Such effects on the MSB, according to the classification explained below, may subsidize the spatial distribution and business zoning in São José dos Campos and region, according to the Municipal Master Plan.

information necessary to document the current and historical condition of this relationship.The indicators sought to reflect the areas occupied by the local human contingent, as well as the aquatic and terrestrial environments impacted by the disorderly settlement of the region. They are long-term, since their monitored events have long-term effects. Therefore, to identify the pattern of the socio-environmental scenario resulting from the influence of improper land use processes in the region, it was found: a) environmental quality indicator; b) water resources quality indicator; c) environmental vulnerability indicator. The Environmental Quality Indicator measures the loss of natural vegetation, expressing the extent to which it has been occupied by human intervention. Considering a built area = 9,043,51 hectares; in a total area = 1,366,962.00 one has:Indicator urban occupation = 9,043.51: 1,366,962.00 = 0.66%

It means that less than 1% ofthe Paraíba do Sul Valley area consists of urban space occupied by the local population. On the other hand, one can calculate: Tree area indicator = 1,134,042.83 hectares: 1,366,962.00 = 82.96%In other words, most of the region (83%) is covered with vegetation, in contrast to the low urban density (0.66%).

Figure 2. Classification of companies according to water and socio-environmental factor

Companies	Water and socio-environmental factor
Social organizations	exercise citizenship actions consistent with their economic activities and ethical behavior. This is the case of cooperatives, associations and social organizations
Commercial Companies	Adopts social and environmental practices to mitigate the potential impacts of marketed products, processes and facilities. Tends to exercise some leadership on issues of interest to the community
Hospitals and Hospitality	adopt social and environmental practices to mitigate the impacts of their services, processes and facilities. The organization leads issues of interest to the community and industry. Encouraging people's participation in social development efforts is systematic. hotels, hospitals and leisure and entertainment service organizations
Durable consumer goods industry	The process of evaluating the impacts of products, processes and facilities needs to be systematized, seeking to anticipate public issues. It usually adopts international certification of the green seal type and/or equivalent, instituted by SA8000, AA1000 and others
Water consumption and wastewater polluting industries	tanning and chemical products
Industries of the highest socio-environmental effect	the nature of which is classified as extremely dangerous, which may give rise to explosions, fires, chatter, the production of gases, dust, exhalation and debris that may be harmful to health or possibly , may endanger surrounding persons or properties; Nuisance – those that may cause noise, chatter, gas, dust, exhalation or traffic disturbance.
Agribusiness with irrigation; Very high water consumption and wastewater polluting industries	tanning; chemical products, extensive crops and crops with high water consumption and pesticides.

Source: Research data

Water resources monitoring: This work, for water resources monitoring, considered the concept of indicators, or metrics, accordingtoTachizawa (2019).Examples can be found in the market as suggested by SABESP (2019) as distribution indicator = number of customers served by distribution network) / (Total number of urban households (IBGE)) X 100. In this formula, there is the number to be considered, generated by the Provider's register, which must be georeferenced and updated. The estimate of total households is consolidated with IBGE data. Another example SABESP (op. cit.) Is the loss indicator, calculated by the = (volume of water produced-volume of water consumed) / (volume of water produced) X 100.Similarly, there is the indicator of financial sustainability = (own collection from water supply / total expenditure on water supply) x 100. This strategic process, through "water planning indicators", in the context of the consortium and the micro-enterprises ("water efficiency indicators).

Water planning indicators: These indicators, within the contours of the socio-environmental guidelines, highlight key aspects of society-nature interaction, and for the generation of

As body of water (9,084.59 hectares), it represents 0.67% of the total area of the region. In summary, when analyzing the region's land cover map, it is found that almost 83% of land use and land cover are native or reforestation vegetation. 14.35% of the territory corresponds to shrubby herbaceous cover, which may include agriculture and native vegetation undergoing regeneration.The built-up area, in turn, occupies less than 1% of the territory (0.66%) and corresponds to the urban areas of the municipalities and rural villages with some degree of densification of houses.Another metric can be calculated by: urban area occupation + agricultural area occupation, divided by natural vegetation area

It was obtained based on the analysis of the values of the area, shape and distance between native vegetation fragments of the municipality and region landscape. It reflects the susceptibility of the landscape to the loss of biodiversity and habitats due to the condition of fragmentation of the native vegetation class, including the different levels of mutation. The results evidenced by the *Environmental Quality Indicator* would allow to identify the areas to be recovered, as some forest

fragments, being these, priority to the conservation of biodiversity. They would highlight the influence of agricultural activities in the settlement areas.They would also emphasize the loss in extension and environmental quality of the remaining natural ecosystems, thus prioritizing the strategic importance of planning the use and occupation of these areas.
This scenario can support planners and decision makers in deliberating possible spatial arrangements for the region from the perspective of preserving the life support systems needed for sustained regional development. It would help the environmental administration agencies to plan and coordinate sustainability management models, especially when considering the interference of a state socio-environmental mapping in relation to the spatial pattern of the municipalities of the region. For the conservation of biodiversity in the local context, it would be essential to develop an effective management and conservation program, together with society's awareness of the complexity of the processes involved in the loss of environmental services. This challenge of reversing ecosystem degradation can be met by metrics that highlight the need for institutional and policy change.As a metric of this type, and derived from the *Environmental Quality Indicator*, another indicator could be structured by type of vegetation, relating its area in hectares to the total.

Another indicator that can be calculated, derived from the *Environmental Quality Indicator*, would be to relate the deforested area to the total area of the municipality and region, which would show the evolution of ecological degradation. It would also allow to indicate the existence of irregular allotments in areas of environmental fragility, intensive agricultural crops in inappropriate areas, deforestation and burning of areas for agriculture and livestock, waste disposal, mining, invasion, among other undesirable aspects. And, with the consequent disorderly occupation of preservation areas, invasions of green areas and lack of protection to public water sources. The metrics highlighted in this topic could signal the implementation of several projects in these areas, without observing the norms of use and occupation, or basic principles of soil conservation. This would avoid further compromising environmental quality and reinforcing the need for new and efficient protection, regulation and control mechanisms. The *Water Resources Quality Indicator* configures the susceptibility of water resources to the distance from impacting sources, in the form of pollutant discharges, pesticide effects, and improper flow of solid waste from land use in terms of volume. Calculated by discharges of pollutants + pesticides used + solid waste, divided by the total extent of the analyzed area.

It would reflect the effects of land use intensity and the spatial pattern of water resource degradation, as they would signal the effective correlation between patterns and processes in the region's ecosystems. Physical factors (topology, hydrology/ waters, geophysicists/lands, and climatic/atmosphere) and biological conditions (flora and fauna) were considered. Metrics inherent to anthropic aspects (social, economic, cultural, health and sanitation factors) can also be measured by observing the philosophy of this *Water Resources Quality Indicator*, namely: Total area of the river basin, divided by Number of inhabitants of the region.

There is an abundance of surface water resources, but for the most part, the quality is compromised by pollution load of industrial and urban origin. Long stretches of the main rivers are quite degraded. The metric, therefore, may be signaling that restoration of degraded zones should be viewed as a legal determination and not as an optional activity. On the other hand, *Environmental Vulnerability Indicator* can be scaled considering that the region's lands play a significant potential role in preventing deforestation, making their forests, on average, better conserved, equivalent to legally protected areas.Information for municipalities, however, indicates that protected areas do not represent a guarantee that deforestation will be avoided. Even because the inhabitants of the region are not inherently conservationist, they can respond to the same economic stimuli that induce other types of people, both natural and legal, to exploit and degrade ecosystems. The indicator that can highlight such potential could be determined by relating to: area occupied by citizens, divided by the total extent of the area analyzed. The application of this indicator identifies the effects of land use intensity, as well as the influence of relationships established by local communities (settlement projects) on the spatial and temporal pattern of the landscape, habitat loss and condition of naturalness and environmental quality of the land. vegetation and water resources of the municipality and region. It would signal the gradual decrease of natural ecosystems and, consequently, the reduction of their responsiveness and adaptation to stressful ecological situations.

Maintaining the integrity of natural ecosystems would be at the core of the development of the *Environmental Vulnerability Indicator*, as ecosystem integrity is threatened by all sorts of risks. It is the propensity to damage due to lack of protection or precariousness or the risk of being affected by a negative impact. It would determine the degree of susceptibility to deterioration through the incidence of environmental impacts, expressing the potential of the landscape to absorb or be disturbed by human activity. Areas with environmental fragility could also be identified by metrics that relate (in hectares)**:** *area by type of land: total area of the analyzed region.*This way it could be possible to determine metrics related to the classes of agricultural aptitude, calculated by the division total area (1,772,678.12 ha.), such as: a) land with regular aptitude for farming at the recommended management level; b) land with exceptional aptitude for crops; c) flooded area.

Water efficiency indicators in companies: Short-term metrics could be calculated by well water consumption divided by consumption per unit. This indicator, applicable in hospital and hotel for example, which were organizations surveyed.The following metrics were based on data from the applied questionnaires, which showed different types of water, such as:

a) hotel (water consumption in liters per day: number of guests = 250 l/day);
b) hospital (water consumption in liters per day: number of beds = 250 l/day);
c) laundry (water consumption: kilogram of dry clothes = 30 kg);
d) retail store (water consumption: number of square meters of the property = Water consumption = 10 liters/m^2;
e) restaurant (water consumption in liters: number of meals = 25l/prepared meal);
f) school (water consumption in liters per day: number students = 50l/student).

Another possible indicator could be determined as: artesian well water consumption divided by the total water

consumption in the companies, showing the proportion of water from the companies' wells exploration in relation to the total consumption in a given period of analysis.Or even rainwater consumption divided by total water consumption in companies. This indicator shows the proportion of water from rainwater harvesting by companies in relation to the total consumption in a given period of analysis. For example, number of companies with reuse (8) divided by the total of companies surveyed (84), equal 0.095.This indicator means that 9,5% of the surveyed companies use water reuse in their production process.This metric can be adjusted according to the concept of environmental water factor seen in the previous topic for the three exemplified cases. The quarry, illustrative case of the industrial company that extracts rocks, grinds, benefits and sells them in the form of gravel in its different granulometry, according to the proposed concept of environmental factor water factor, was classified as point G (see figure 1). But given that its truck fleet adopts alternative diesel fuel, thus achieving CO_2 savings, it was diagnosed that it could be relocated to the "F" point as a promotion for such environmental gain. Its efficiency indicator, now environmental water, would take into account in its numerator this sustainable compensation:

Water consumption – reuse – CO_2 reduction gain: Similarly, in the case of the transportation company, viewed at point D and, given the environmental gain from the recycling of fuel oil, which would return as biodiesel, in addition to the reuse of water in the washing system of its truck fleet, it may be promoted to that point. "C" of the scale. This, in addition to the replacement of fuel of mineral origin by biodiesel; and to demand that its suppliers adopt the green cause with the use of clean energy and improvement in their production processes, with corresponding CO_2 reduction. Its efficiency indicator, now environmental water, would take into account in its numerator this sustainable compensation:

Water consumption – reuse – additional sustainability gain: And as a laundry company with a dyeing service, with high water consumption, even with deduction of the reuse of this water resource, is positioned at point F. However, as it uses laser beam to discolor your ordered jeans, whose characteristic is a marked consumption. additional water can be promoted to point E. Its efficiency indicator, now environmental water, would take into account in your numerator this sustainable compensation: numberof companies with own wells (8) and total of companies surveyed(91) result an indicator of 0.09, that means that 9% of the surveyed companies have artesian wells. These management indicators for microenterprises could be compared with those found in consortium of excellence in other regions of the state of São Paulo. Benchmarking comparing CODIVAP management indicators with those obtained in the management of other inter-municipal consortium could be developed as a benchmark for excellence. In this benchmarking, for example, indicators could be developed combined with: a) number of houses with high speed fixed internet, b) loss rate in water distribution; and c) number of times when water distribution system outages occurred. Each indicator could be weighted according to its relevance and those considered positive would show that the municipality has been providing better living conditions for the population.

Water and environmental services sharing: The proposal adopted considered the creation of a Shared Services Center - CSC, within the scope of CODIVAP, formalized in the structure of the consortium of municipal governments of the cities of Vale do Ribeira. The CSC, linked to CODIVAP, uses the administrative infrastructure of the City Hall of Registro/SP. Its activities are consistent with the São José dos Campos Master Plan, as described in topic 3 (PMSJ, 2019). It was assumed that there is pent-up demand for services, according to data verified in the survey. The management of public services, with the advent of CODIVAP, can be shared in areas of activity of its partner municipalities, such as: basic sanitation; urban development; transportation; environment; housing; tourism; health; and education. This innovative form of public service management is a proposal for the future implementation of a Shared Services Center, within the organizational configuration of CODIVAP, using the administrative infrastructure existing in the São José dos Campos City Hall in less usual ways, areas such as: culture; employment and work; public security; and social assistance. The survey data, according to the data collection script applied, showed that health, followed by the environment, are the main areas of action that CODIVAP should act, in the opinion of the managers of the MSB participating in this exploratory research. Given this context, it was timely to propose the implementation of a shared Service Desk as discussed in the topics explained in table 3, below.

Table 3. Areas of expertise of CODIVAP according to MSB

Areas of practice	Qty	%
Health	20	21
Environment	18	19
Education	10	11
Employment and work	8	9
Housing	6	7
Urban Development	5	6
Basic sanitation	4	5
Others	20	22
TOTAL	91	100%

Source: Research data

Unusually, areas such as: culture; employment and work; public security; and social assistance. The survey data, according to the data collection script applied, showed that health, followed by the environment, are the main areas of action that CODIVAP should act, in the opinion of the managers of the MSB participating in this exploratory research. Given this context, it was timely to propose the implementation of a shared Service Desk as discussed in the topics explained below.To optimize public resources, the sharing of: purchases; financial services; information technologies; logistics and transport; social and environmental orientation; and other related services.

Application of water factors: The sustainability procedures outlined can be adopted to diagnose ACI affiliated companies, either with the support of the Shared Services Center, or individually by the company itself in the form of self-diagnosis.Possible strategies to be implemented will depend on the range of application of the proposed water factors: a) exclusively involving the company itself, in which the self-assessment was performed in a unique way; b) covering several companies for interaction with the commercial bank involved in operations of financial resources; c) covering various companies for interaction with development banks and foreign development institutions; and d) environmental education for managers and technicians of companies in the region.

Water efficiency certification: It is proposed the issuance of a water efficiency certificate (WEC) by ACI, for that MSE holding conditions to request financial operations within the socio-environmental prerequisitesregulatedby Bacen (2019).To this end, WEC would maintain a database (positive water and environmental register) of companies, highlighting the stage they are in in terms of sustainability.The WEC would preserve a table of water and environmental factors in its database, for the purpose of providing technical guidance to its affiliated companies, as well as for issuing the CEH. Microenterprises with this certificate would be entitled to obtain financial resources, in accordance with the legal regulation of financial institutions, in accordance with the Central Bank ofBrazil (Bacen, 2019).This certificate would be in line with the São José dos Campos Master Plan, approved by the CODIVAP Management Committee, for MSB that demonstrate low water consumption and no waste disposal and environmental degradation. The electronic portal architecture considered the external environment, with its legal variables (at its state and municipal levels), as the basic assumption.Its principles could be summarized as: a) organization with extended borders; b) hierarchy of decisions; c) partnerships and strategic alliances; d) outsourcing and network organization; e) strategic use of information technologies; f) management and performance indicators.

Partnerships and informational media: The portal would serve the network formed by the junction of municipalitiesofthe Paraíba do Sul Valley, located in the territory covered by the IntercityConsortium - CODIVAP, which have affinity in their legal attributions and maintain links of articulation, interaction, cooperation and learning with themselves and with other local actors such as government, business associations, credit institutions, education and research. Partnerships between the São José dos Campos City Hall could be signed with local institutions for the granting of social and environmental certificates to its affiliated companies. These are micro and small companies that comply with the strict requirements prescribed for obtaining environmental water efficiency certification in the region in which they are located. Another approach that can be implemented is environmental education with the use of virtual reality and augmented reality resources, enabling the training of volunteers and citizens in an environment that reproduces the characteristics of the Atlantic Forest in the classroom. This partnership would use the institution's Computer Lab, for the purpose of providing the necessary hardware platform for the development and maintenance of the virtual reality environment, serving as a virtual zoo. In this environment, the citizen could take a tour through the fauna and flora of the Atlantic Forest, fully reproduced in the laboratory.

This would make it possible to eliminate the zoos kept in the region. Agreement with the local governments of the region, could replace the traditional physical zoos, with the virtual recreated in the laboratory.Partnerships with companies in the region would allow them to access social and environmental data from the shared portal database and transform them into social and environmental balance sheets that, accordingtoTachizawa (2018), requiretransparency requirements required by ISO14000, 16000, SA8000, AA1000, OHSAS18000 certifications and equivalents. To this end, an alliance with the Ethos InstituteandAkatu, wouldallow training for inventory and preparation of social and environmental balance in the standards dictated by these institutions.

Conclusions

As a main conclusion, we identified socio-environmental practices incurred in the Vale do Paraíba microenterprises, whichinfluence the consumption of water resources. It was also established an understanding of the dynamics of the water management process to develop metrics for monitoring social and environmental actions, both in the context of water resources in the sphere of CODIVAP and in relation to water as productive inputs of MSB. Additionally, it was developed: a) diagnosis of MSB in the municipality of São José dos Campos (SP), taking into account their segment of activity (industrial, commercial and services); b) analysis of the effects of the implementation of the Intercity consortium on the use of water; c) planning of a service center within the scope of CODIVAP, for the development of infrastructure services, according to the needs perceived by the managers of the surveyed MSB (socio-environmental services, information technology, environmental education and the like). It would allow a data sheet to be consolidated to gather information on corporate sustainability in the CODIVAP context. An organization, whatever its management style, has socio-environmental "effects", which are differentiated as a result of the economic sector in which it operates. These effects can be represented as “Compensation” (socio-environmental liabilities). This liability arises from the “inputs” consumed in the company's production chain. Therefore, the organization needs to exercise actions in return, in the form of “Compensation” (sum of values). In this case, social and environmental actions (Compensation) would be the amount of social and environmental decisions, at the initiative of the company's management, to preserve the productive processes in a sustainable way. It is how much of the productive inputs and management measures needed to continue to produce goods and services that consume and absorb productive resources in the form of raw materials. It would be like being satisfied with the survey of emissions and projections of carbon neutralization, through the planting of tree seedlings. Such socio-environmental diagnosis, coherently with the sustainability analysis factors, can be represented as a BSH balance, as proposed in this paper.Another contribution from this research is the typology of organizations that allowed the classification of companies according to water and social and environmental factors.

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