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Intermunicipal cooperation in the National Environmental Policy: do state capacities matter?

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The institutional framework of the National Environmental System assigns complex responsibilities to municipalities, which are often unviable in financial, technical, and operational terms. Cooperation emerges as an alternative to face the lack of resources and the inability of some municipalities to execute the guidelines provided for by the National Environmental Policy in an isolated way. This research examines the relationship between intermunicipal cooperation and municipal state capacities in the implementation of the environmental policy in Brazil, aiming to identify if state capacity, in different dimensions, is a relevant characteristic for municipalities participating in environmental public consortiums. This research used secondary data to employ a quantitative approach through logistic regression analysis, investigating the occurrence of intermunicipal cooperative arrangements in 4.479 Brazilian municipalities. In general terms, the results demonstrate that high administrative capacity and greater fiscal performance tend to reduce the incentives for the municipality to cooperate with others while implementing the PNMA at the local level. Also, the findings indicate that the availability of technical, political-relational, and institutional capacity increases the probability of cooperation.
Keywords: national environmental policy; intermunicipal cooperation; state capacities; local governments.

Cooperação intermunicipal na Política Nacional de Meio Ambiente: as capacidades estatais importam?

O desenho institucional do Sistema Nacional de Meio Ambiente (Sisnama) atribui aos municípios responsabilidades complexas e, muitas vezes, inviáveis em termos financeiros, técnicos e operacionais. Diante disso, a cooperação surge como uma alternativa para enfrentar a ausência de recursos e a incapacidade de alguns municípios executarem, de maneira isolada, as diretrizes previstas pela Política Nacional de Meio Ambiente (PNMA). Esta pesquisa examina a relação entre cooperação intermunicipal e capacidade estatais municipais na implementação da política ambiental no Brasil, visando identificar se essas capacidades, em suas diferentes dimensões, têm características relevantes para os municípios que participam de consórcios públicos na área de meio ambiente. Com o uso de dados secundários, a pesquisa empregou uma abordagem quantitativa, por meio da análise de regressão logística, investigando a incidência dos arranjos cooperativos intermunicipais para 4.479 municípios brasileiros. Os resultados encontrados demonstraram, em linhas gerais, que, na implementação em nível local da PNMA, uma alta capacidade administrativa e maior desempenho fiscal tendem a diminuir os incentivos para o município cooperar com outros, enquanto a disponibilidade de capacidade técnica, político-relacional e institucional aumenta a probabilidade de cooperação.
Palavras-chave: política nacional de meio ambiente; cooperação intermunicipal; capacidades estatais; governos locais.

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Cooperación intermunicipal en la Política Ambiental Nacional: ¿importan las capacidades del estado?

El diseño institucional del Sistema Nacional Ambiental asigna responsabilidades complejas a los municipios, muchas veces inviables en términos financieros, técnicos y operativos. Ante esto, la cooperación surge como una alternativa para enfrentar la falta de recursos y la incapacidad de algunos municipios para ejecutar los lineamientos previstos por la Política Nacional Ambiental (PNMA) de manera aislada. Esta investigación examina la relación entre la cooperación intermunicipal y las capacidades estatales municipales en la implementación de la política ambiental en Brasil, con el objetivo de identificar si las capacidades estatales, en sus diferentes dimensiones, tienen características relevantes para los municipios que participan en consorcios públicos en el área de medio ambiente. Con base en el uso de datos secundarios, la investigación emplea un enfoque cuantitativo, a través del análisis de regresión logística, investigando la incidencia de los arreglos cooperativos intermunicipales para 4.479 municipios brasileños. Los resultados encontrados demuestran, en términos generales, que en la implementación a nivel local de la PNMA, una alta capacidad administrativa y un mayor desempeño fiscal tienden a reducir los incentivos para que el municipio coopere con otros, mientras que la disponibilidad de recursos técnicos, la capacidad político-relacional e institucional aumenta la probabilidad de cooperación.

Palabras clave: política ambiental nacional; cooperación intermunicipal; capacidades del estado; gobiernos locales.

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1. INTRODUCTION

In Brazil, the concern for acting in an integrated and joint manner in the preservation of natural resources motivated the creation of the National Environmental System (Sisnama) in 1981. Besides creating the National Environmental Policy (PNMA), the legal framework established goals for the sector, created mechanisms for environmental protection, and defined the responsibilities for the different levels of government.

On this last aspect, although Sisnama was conceived in a centralizing and authoritarian political-institutional scenario, its provisions defined a prominent place for subnational governments in the management of environmental policies (Moura, 2016). Later, however, the 1988 Constitution of the Federative Republic of Brazil (Constituição da República Federativa do Brasil de 1988) consolidated, in institutional terms, in its article 23, VI, the importance of intergovernmental cooperation in the sector, establishing as shared competence among the federated entities the protection of the environment and the fight against pollution in any of its forms.

Sisnama and the legislations that followed the Federal Constitution outline a decentralized institutional design for the country's environmental policy, instituting a multilevel governance model for policy management (Abrucio & Sydow, 2018). In this governance structure, the National Environmental Council (Conama) plays an advisory and deliberative role, while states and municipalities are responsible for implementing the policy. This overlapping of subnational attributions was one of the motivators for the creation of Supplementary Law number 140, from December 8, 2011 (Lei Complementar nº 140, de 8 de dezembro de 2011), which details the responsibilities of subnational entities. This same legislation also highlights instruments of federative cooperation (Leme, 2016), pointing to the creation of public consortia as a strategy with potential for implementing joint actions.

Given this institutional design, municipalities ended up taking on complex and often infeasible responsibilities in financial, technical, and operational terms, as in the case of attributions related to environmental licensing, basic sanitation, management of protected areas, and the proper disposal of solid waste, among others. Therefore, intermunicipal cooperation emerges as a solution for environmental policy at the local level (Leme, 2016; Neves, 2012). That is, it is assumed the inability of some municipalities to execute, in isolation, the guidelines provided by the National Environmental Policy (Neves, 2014, 2016).

Based on these initial considerations, this research addresses the issue of inter-municipal cooperation in the local implementation of environmental policy in Brazil and its relation to the state capacities of municipalities. Therefore, it seeks to answer the following question: to what extent do state capacities explain the insertion of municipalities in cooperative arrangements for the implementation of environmental policies at the local level?

This being said, the purpose of the paper is to identify whether state capacities, in their different dimensions, are relevant characteristics for municipalities that participate in public consortia in the field of environment. To this end, the research adopts a quantitative approach, through multivariate analysis, investigating the incidence of inter-municipal cooperative arrangements in 4,479 Brazilian municipalities.

For the analysis, secondary data from the year 2017 were used, especially those from the Municipal Basic Information Survey (Munic) of the Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatística [IBGE]), choosing to consider the occurrence of environmental public consortia as a proxy for formal horizontal cooperation. In parallel, secondary data from IBGE, related to the state capacity of municipalities, and the Firjan Index were also collected in order to operationalize the explanatory variables in a logistic regression modeling.

This paper addresses the issue of intergovernmental cooperation and possible relations with local state capacities, an aspect rarely observed by the literature, especially the national literature. Based on the quantitative approach adopted, it is expected to advance the theoretical and empirical debate beyond the description of successful associative initiatives (Machado & Andrade, 2014), contributing directly to the debate on the causal mechanisms that drive interlocal cooperation in Brazil, already initiated by authors such as Doin, Lopes, Afonso, and Rigo (2020), A. A. T. Fernandes, Figueiredo, Rocha, and Nascimento (2020), Mazzali and Niero (2015), and Pereira and Moreira (2016). From another point of view, the research also ends up having potential for practical discussion, so that it can contribute to the improvement of institutional mechanisms that favor inter-municipal cooperation in the environmental sector.

This paper is structured in five sections, in addition to this introduction. The first section explores the causal mechanisms that, according to the literature, commonly explain cooperation, as well as the debate associated with state capacities. In the second, we seek to present the protagonist role of municipalities in the implementation of the National Environmental Policy, with emphasis on the relationship between the attributions established in the National Environmental System and the local capacities available. In the third section, the research methodology is presented. The fourth section presents the results obtained. Finally, the fifth section presents the final considerations, with the summary of the main results, the conclusions and the research developments.

2. INTERMUNICIPAL COOPERATION AND STATE CAPACITIES: OUTLINING CONCEPTS AND EXPLORING CAUSAL MECHANISMS

Cooperation and competition are intergovernmental relationship dynamics inherent to federative systems (Agranoff, 2007; Watts, 2006). By dividing political power among different levels of government, federations produce an institutional environment marked by governmental interdependence. More clearly, however clearly delimited the distribution of attributions may be, the decisions taken by one constituent unit can provoke effects on others. Thus, these intergovernmental interactions can occur both vertically, between different levels of government, and horizontally, with governments at the same level of government.

Watts (2006) points out that the main challenge for the preponderance of a cooperative model lies in establishing a balance between joint efforts and maintaining autonomy in the formulation of local public policies. According to the author, cooperation is more necessary in federative countries marked by deep territorial inequalities. Agranoff (2007), on the other hand, brings a more accurate delimitation of the concept of intergovernmental cooperation, indicating that it is the joint action of two or more constituent units that can be connected through economic devices, administrative practices, political or administrative bodies, and legal instruments.

The relevant literature began to present a series of determinants capable of influencing the emergence of joint actions by different local governments, as shown by Bel and Warner (2015). These same determinants vary from approach to approach and can have different effects across public policies, since policymakers tend to react to different incentives regarding horizontal cooperation according to the model of federalism (Meza, Grin, A. S. Fernandes, & Abrucio, 2019), to the institutional design of each policy formulated by the central government (Grin & G. A. Fernandes, 2021) or by sectoral field (Strebel & Bundi, 2022).

Amidst this, determinants linked to demographic characteristics are predominant in much of the analysis. Variables of this type are particularly relevant because they determine the real possibilities for municipalities to reach economic scales (Mello & Lago-Peñas, 2013). Thus, although it is not a consensus and depending on the type of service or the area of public policy, there is evidence that cooperation tends to be more attractive for municipalities with lower demographics (Bel & Warner, 2015; Carr, LeRoux, & Shrestha, 2009; A. S. A. Fernandes, Pinheiro, Nascimento, & Grin, 2020; Leroux & Carr, 2007; Pereira & Moreira, 2016). In addition, there is also a greater tendency for municipalities with lower levels of urbanization to cooperate with others (Hefetz & Warner, 2011; Mello & Lago-Peñas, 2013).

Within the scope of local community characteristics, cooperation is more present when the socioeconomic and demographic contexts of the cities are more homogeneous (Feiock, 2007). In this sense, there is evidence of the concept's relationship with factors such as age (Morgan & Hirlinger, 1991) and racial differences (Leroux & Carr, 2007), human development, and income inequalities. A. S. A. Fernandes et al. (2020), for example, identified that, in the Brazilian context, municipalities with lower Human Development Indexes and lower income inequality are more likely to cooperate in the provision of services for the disposal of solid waste.

Another set of variables relates to the mimetic behavior of municipalities and the diffusion patterns of cooperative arrangements associated with previous experience and the regional neighborhood

effect. In this perspective, authors such as Di Porto and Paty (2018) and Rubado (2021) indicate that municipalities will be more inclined to cooperate when their neighbors are already involved in some kind of cooperative initiative. On the other hand, authors such as A. S. A. Fernandes et al. (2020) and Strebel and Bundi (2022), identify that previous cooperative experiences increase the probability of inter-municipal joint action.

Political determinants are also present in the literature, as local political institutions shape the available information and incentive structure available to political and bureaucratic government actors when deciding to cooperate or not (Feiock, 2007). In terms of variables, Bel, Fageda, and Mur (2013) point to ideology, with municipalities governed by left-wing parties cooperating more than those governed by right-wing parties. Feiock (2009) draws attention to the fact that cooperation between local governments depends strongly on the proximity of values between political parties. In contrast, studies that analyze Brazilian municipalities, such as that of A. S. A. Fernandes et al. (2020) and that of Pereira and Moreira (2016), show a negative association between belonging to the political base of the state government and participation in public consortia. In addition to this factor, extended mandates for political actors matter because of the decrease in uncertainty and the increase in long-term perspectives for management (Feiock, 2007; Meza et al., 2019). Along these lines, scenarios of high local electoral competitiveness may imply lower political balance and a higher veto point for cooperation, especially in the legislative arena.

Given this set of variables, questioning the role of local state capacity as a possible predictor of inter-municipal cooperation is not a trivial task. The conceptual intertwining present in this debate needs to be highlighted more clearly, given the incipient nature of this relationship in the empirical and theoretical sense.

In Skocpol's (1985) view, state capacity implies states capable of implementing actions arising from official objectives, even with the opposition of powerful social groups or persistent socioeconomic frameworks. Although it is a multidimensional concept by nature, disaggregating state capacity into specific axes for analytical purposes has been an alternative adopted to provide greater theoretical cohesion to the studies, thus making it feasible to measure this construct (Cingolani, 2013; Hanson & Sigman, 2021).

Considering this analytical strategy of conceptual disaggregation, it is possible to measure state capacity as synonymous with administrative capacity (Fukuyama, 2013; Grindle, 1996; Haque, Ramesh, J. A. P. Oliveira, & Gomide, 2021), technical capacity (Grindle, 1996), financial (or fiscal) capacity (Besley & Persson, 2008, 2010; Cingolani, 2013), political-relational (Grin, Demarco, & Abrucio, 2021; Grindle, 1996; Pires & Gomide, 2016), and institutional (Grindle, 1996).

Meanwhile, in the literature, there are still few operationalized variables to measure the influence of these dimensions of capacities on inter-municipal cooperation. The *financial capacity* is the one that presents primacy in the state of the art, being related to the State's ability to extract resources from the population and thus finance its actions (Besley & Persson, 2008, 2010; Cingolani, 2013). The predominance of this type of capacity in the analyses can be explained by the recognition that the main motivation for cooperation is the possibility of reducing costs in the provision of services that municipalities are obliged to provide by current legislation (Bel et al., 2013; Leroux & Carr, 2007).

Bearing such points in mind, the hypothesis that imbalance in the ratio between expenses and revenues (fiscal stress) triggers a greater chance of joining cooperation is well established, as Bel

and Warner (2015) point out. Authors such as Di Porto and Paty (2018), A. S. A. Fernandes et al. (2020), Morgan and Hirlinger (1991), and Pereira and Moreira (2016) present empirical evidence that low municipal fiscal capacity leads to an increased likelihood of cooperation in municipalities when offering certain public services. Complementing this, Sørensen (2006) further indicates that municipalities with high financial capacity have little preference in sharing actions, especially if most of the neighboring cities are poorer.

Also, in terms of available financial resources, Bel and Warner (2015) call attention to how much a research design can influence the expected causal relationship. According to the authors, sample studies that include local governments from smaller cities are even more likely to find a positive association between fiscal constraints and cooperation. Although the most logical result would mean that lower fiscal capacity leads municipalities to cooperate, the opposite association also occurs in specific works, such as those by Doin et al. (2020) and Mazzali and Niero (2015), focused on the Brazilian scenario.

In addition to fiscal capacity, *administrative capacity* has also been targeted by researchers (Feiock, 2007; A. S. A. Fernandes et al., 2020; Hefetz, Warner, & Vigoda-Gadot, 2014; Meza et al., 2019; Morgan & Hirlinger, 1991), being pointed out, directly or indirectly, as a possible characteristic that local governments consider for their insertion in cooperation arrangements. This capacity involves the competence of the state power to perform basic administrative functions for the provision of public policies to citizens (Grindle, 1996; Hanson & Sigman, 2021; Haque et al., 2021), with emphasis on the structuring of public organizations appropriate to the size of demands and the quality of the bureaucracy (Cingolani, 2013). Therefore, by assumption, administrations more capable of implementing better policies are those that have, in general, a Weberian bureaucracy of stable ties recruited based on merit, insulated from political constraints, duly professionalized and of impartial performance (Fukuyama, 2013; Haque et al., 2021; Rothstein & Theorell, 2008). Therefore, it is a capacity commonly associated with municipal public policy outcomes in decentralized implementation contexts (Batista, 2015; Marenco, 2017).

In scenarios of asymmetric federalism and evident regional inequalities between the capacities of municipalities (Souza & Grin, 2021), as in the case of Brazil, empirical analyses of the relationship between cooperation and reduced administrative structures are still needed. However, it should be considered that the reduced availability of this governmental attribute makes it infeasible to offer services at the local level, especially the more decentralized ones, which demand a larger contingent of bureaucrats. Therefore, cooperation can be rationally seen by policymakers as a viable alternative to compensate for the lack of resources that are so important in the production of policies at the local level, since services would be executed by an interlocal organizational structure, through the sharing of processes, responsibilities and pre-defined resources (Agranoff, 2007; Feiock, 2013; Grin, 2021; Le Roux, Brandenburger, & Pandey, 2010).

Technical capacity, in turn, can be seen as an extension of administrative capacity (Cingolani, 2013), in which management mechanisms and the public administration's ability to formulate policies, analyze alternatives, and process information for decision-making are emphasized (Filgueiras, Koga, & Viana, 2020; Grindle, 1996; Wu, Howlett, & Ramesh, 2018). Given the conceptual nature of this capacity dimension, it is believed that the debate about overcoming the technical challenges to the viability of cooperation agreements (Bel & Warner, 2015; Feiock, 2007; Meza et al., 2020) passes

directly through the way municipalities structure the planning of their policies of interest, especially for the Brazilian case, in which municipal plans are formalized to articulate federal and state policies to municipal management (Rezende, 2009). In other words, the most logical assumption is that policy planning is an indication of the municipal management's commitment to the long-term objectives and goals of a public policy, making it structured and open to the possibility of cooperation agreements to successfully fulfill them.

Regarding the *political-relational* capacity, this dimension focuses on state commitments to society (Grin, Demarco, & Abrucio, 2021) and interactions with other political agents (Pires & Gomide, 2016; Wu, Howlett & Ramesh, 2018), which relate to the state institutionalized channels through which the demands of the different political and social actors involved in the process of producing public policies are handled (Araral et al., 2015; Grindle, 1996; Pires & Gomide, 2016). In this sense, from the interlocal point of view, the construction of formal and informal networks and participation in horizontal arenas of repeated interaction with other mayors can expand learning and the acquisition of new information about the feasibility of cooperative arrangements (Carr, LeRoux, & Shrestha, 2009; Feiock, 2007, 2009; Le Roux, Brandenburger, & Pandey, 2010; Rubado, 2020).

Another way to operationalize this relational dimension in the concept of state capacities is through the existence and operation of public policy councils at the subnational level, as done by authors such as Coelho, Guth, and Loureiro (2020), Fontanelli (2020), Grin et al. (2018), and Silva (2015). In the specific case of Brazilian municipalities, councils function as spaces for dialogue and approximation between the State and society, ensuring a democratic character for local management (Grin, Demarco, & Abrucio, 2021). As they are also mechanisms of social control and accountability (Tatagiba, 2005), councils confer greater political and social legitimacy to certain policies, bringing relevant implications for inter-municipal cooperation. Along this line, the learning generated by the interaction between government and society and the social pressure legitimized by institutionalized demands could encourage or constrain local administrators to cooperate with other municipalities as a way to ensure that these demands are met.

By *institutional capacity*, we define the normative framework available to governments to regulate aspects of their policies of interest, so that it coercively guides the social behavior of the actors potentially involved (Cingolani, 2013; Grindle, 1996). From this perspective, the literature on cooperation and local governments highlights the role of legislations (Feiock, 2007; Klok et al., 2018; Meza et al., 2019), but emphasizing only those that regulate cooperation, with little focus on the norms of public policies themselves. With this gap in place, it is understood that the larger and more complex the normative and regulatory framework of local policies, the greater the amount of public services that governors are required to provide for the population, which could drive the search for cooperative outlets. Not only that, but the larger this normative framework, the greater the range and diversity of instruments and legal devices to be mobilized by the municipality, which tends to increase the complexity for the implementation of the policy by the local management.

The roles that local governments play in the adoption of a policy and the existence or not of institutional incentives for joint governmental action are central elements to understanding the emergence of cooperative efforts. Thus, for the purposes of this study, it is fundamental to understand the place that municipalities (with their capacities) and intergovernmental cooperation have in the institutional design of Brazilian environmental policy.

3. THE ROLE OF MUNICIPALITIES IN THE IMPLEMENTATION OF THE PNMA

Also in the early 1980s, Brazil instituted the National Environmental Policy (PNMA) and created the National Environmental System (Sisnama), the first systemic institutional design in public policies in the country (Silva et al., 2021). Federal Law No. 6.938/1981 defined that the Union, states, Federal District, territories, and municipalities were co-responsible for adopting policies to protect and improve the environment, all of them being constituents of Sisnama. Reflecting the efforts of the international environmental movement (Neves, 2016; Santaella et al., 2014), the idea of that new institutional framework was to align and integrate actions and programs throughout the national territory.

Since the 1988 Constitution (Constituição da República Federativa do Brasil de 1988), numerous legislative innovations have been adopted aiming to improve the local implementation of PNMA. Supplementary Law No. 140, of December 8, 2011 (Lei Complementar nº 140, de 8 de dezembro de 2011), regarded as the main recent legislative advance, provides greater clarity for the attributions of each entity (Leme, 2016; Neves, 2014). In Article 9, municipalities are assigned 15 actions regarding environmental policy, ranging from more specific actions, such as the management of environmental resources like vegetation and forests, to the promotion of integration between the different state actors at the three levels of government for environmental management.

In this context, the protagonism of local governments becomes evident for the implementation of PNMA. In general, in the national literature (Carvalho, S. M. Oliveira, Barcellos, & Assis, 2005; Leme, 2016), there is a signaling, according to the PNMA guidelines, for some elements that qualify the capacities of environmental management, such as the presence of managing entities responsible exclusively for the matter; technical staff with strong links in the civil service; environmental funds; municipal legislation on the environmental theme and municipal environmental councils. However, authors such as Leme (2016) and Neves (2014, 2016) question whether, with all this legal framework, municipalities are, in fact, prepared to take on the responsibilities established, since, within Sisnama, they are the entities with the weakest installed capacities, even if there is an indication of gradual growth of these capacities over time.

Another important aspect concerning Supplementary Law No. 140 from December 8, 2011 (Lei Complementar nº 140, de 8 de dezembro de 2011) is the incentive to interfederative environmental cooperation (Leme, 2016). The normative created the National Three-Party Commission, with the participation of representatives from the three levels of government, and which focuses mainly on resolving federative conflicts. In other words, it was instituted to settle the legal uncertainties that surrounded the governments regarding the concurrent competencies and responsibilities that were left open both by PNMA and by Article 23 of the 1988 Federal Constitution (Moura, 2016). It also highlights the possibility of using public consortia as a tool for joint action. Consortia can be defined as a contractual instrument of public legal regime that ensures the partnership between public entities for the implementation of services, through the division of responsibilities (Grin, 2021). Classic examples of application of this instrument are those aimed at solid waste management and basic sanitation, in which municipalities cooperate to maximize resources - tending to scarcity on this scale - and perform these activities in expectation of positive collective results.

Given this framework, the municipality, in this sense, is one of the possible users of this instrument, especially because it is the main responsible for the execution of local environmental policy. At the

same time, it is in local governments, in general, where there are the greatest regional disparities in terms of fiscal and administrative resources, making the effective environmental management of the national territory even more complex (Leme, 2016). Intermunicipal cooperation emerges, therefore, as a solution to face the obstacle of technical and financial difficulties (Neves, 2012).

In summary, the absence of a regular source of funding and the dependence on own resources can lead municipalities to empty their environmental agendas at the local level (Neves, 2014, 2016). With this, considering the multilevel model of implementation of PNMA, cooperation through consortia is of fundamental importance for the success of actions formulated at the federal level, since the non-adoption by municipalities of their exclusive competencies can impact the production and maintenance of environmental public goods regionally or nationally (Neves, 2012). In addition, the use of the consortium as an instrument of collective action by municipalities also gains greater prominence with other problems that still afflict the institutional design of Sisnama, such as the incipient federative support and the absence of means to compensate for inequality in governance capacity (Neves, 2014).

4. METHODOLOGY

Aiming to meet the proposed objective, this study is methodologically structured under a quantitative approach. To this end, secondary data on environmental management in Brazilian municipalities for the year 2017 were used. Within this sample, 4,479 local governments were analyzed, considering the availability of data for the composition of variables.

Because this is a study focused on the variation between several spatial units in a single time frame, the research design is characterized as observational cross-section (Kellstedt & Whitten, 2015). The main data source for the study was the IBGE Munic Survey. Secondary data produced by IBGE on municipalities, explained below, and data from the Firjan index of municipal fiscal management were also used. In all, the study has 13 variables, as summarized in Box 1.

BOX 1 VARIABLES SELECTED FOR THE STUDY

Dependent Variable	Operationalization	Source	Expected Sign
Cooperation	A 1 is assigned to municipalities participating in public consortia in the environmental area, and 0 to those that are not.	Munic – IBGE (2017)	**N/A**
Independent Variables	**Operationalization**	**Source**	**Expected Sign**
Organizational Structure	A 1 is assigned for municipalities that have a specific secretariat for the environmental department, and 0 for those that do not.	Munic – IBGE (2017)	-
Workforce	Proportion of civil servants in the environmental department per 1,000 inhabitants.	Munic – IBGE (2017)	-

Continue

Independent Variables	Operationalization	Source	Expected Sign
Bureaucracy Autonomy	Percentage of civil servants in the environmental department with a statutory employment contract.	Munic – IBGE (2017)	-
Environmental Planning	A 1 is assigned for municipalities that had an integrated plan for solid waste management, and 0 for those that did not.	Munic – IBGE (2017)	+
Fiscal Management	Aggregate multidimensional index, ranging from 0 to 1.	Firjan (2017)	-
Fund	A 1 is assigned to municipalities that have an environmental fund and 0 to those that do not.	Munic – IBGE (2017)	-
Council	Number of meetings held by the environmental council of the municipality throughout the year. For municipalities that did not have a council, the value 0 was adopted.	Munic – IBGE (2017)	+
Legislation	Counting from 11 possible environmental legislations for each municipality.	Munic – IBGE (2017)	+
Controls	**Operationalization**	**Source**	**Expected Sign**
Partnership with the Private Sector	A 1 is assigned to municipalities that participate in a partnership with the private sector, and 0 to those that do not.	Munic – IBGE (2017)	-
Metropolitan Area	A 1 is assigned for municipalities that are part of metropolitan areas and 0 for those that are not.	IBGE (2017)	-
Population (Log10)	Yearly estimation of the municipality's population.	IBGE (2017)	-
GDP *Per Capita* (Log10)	GDP distribution in proportion to the municipality's population.	IBGE (2017)	-

Source: Elaborated by the authors.

The dependent variable **Cooperation** is a dummy that indicates the occurrence of cooperation among Brazilian local governments in actions aimed at environmental management. Its measurement is based on the participation (1) or not (0) of municipalities in public consortia in the environmental sector. The independent variables listed in Box 1, on the other hand, were divided into five distinct dimensions of state capacity based on the literature review, namely: administrative capacity; technical capacity; financial capacity; political-relational capacity, and institutional capacity.

In the administrative capacity axis, the variables **Organizational Structure**, **Workforce** and **Bureaucracy Autonomy** are present. The first of these variables is a dummy measured by the existence or not of an environmental department in the municipality, which indicates the extent of the available administrative structure. The second, on the other hand, was measured based on the proportion of available environmental civil servants per thousand inhabitants, a more operational aspect that captures the contingent of bureaucracy to implement environmental policy. The third and last one is a *proxy*, measured by the percentage of civil servants in the environmental department with a statutory

employment contract in relation to the total number of civil servants in the sector, which indicates the bureaucratic stability and the absence of eventual political constraints (Fukuyama, 2013).

For the technical capacity dimension, there is the dummy variable **Environmental Planning**, measured as a *proxy* for the existence of an integrated plan for solid waste management. Therefore, the aim is to verify whether municipal participation in the cooperation is associated with medium and long-term objectives in local environmental management. Unlike the factors pointed out for administrative capacity, in this dimension, a positive association between capacity and cooperation is expected.

The financial capacity axis is composed of the variables **Fiscal Management** and **Fund**. Of these, the first is measured based on the Firjan index for fiscal management of Brazilian municipalities, a multidimensional indicator that evaluates aspects such as tax collection; the financing capacity of the administrative structure; spending on human resources; compliance with financial liabilities, and investment capacity to qualify the fiscal management of Brazilian municipalities. The indicator ranges from 0 to 1, and the closer to 1, the better the fiscal performance of the municipality. The variable **Fund**, on the other hand, is a dummy that identifies the municipalities that had a municipal fund for the environmental area in the analyzed period, which reveals the readiness of resources for application in environmental management.

Regarding the political-relational capacity, the variable **Council** was included in order to verify whether, to some extent, an efficient and active municipal council endogenously induces the willingness of local governments to cooperate. To this end, we sought to count the number of meetings held by each municipal environmental council throughout the year.

As for institutional capacity, we sought to verify the influence of the municipal regulatory apparatus on the participation in inter-municipal cooperation by taking into account the variable **Legislation**. To this end, Munic's data were used to count 11 possible environmental laws, whereby the greater the number of such laws available, the higher the level of complexity of the municipality's environmental legislation in general.

In addition to the explanatory factors previously described, a series of supporting explanatory factors were included in the analysis for control purposes, generating greater precision in establishing the proposed causal relationships and in scaling the corresponding effects between the dependent and independent variables (Kellstedt & Whitten, 2015). These control variables (Box 1) capture some elements suggested by the literature as well as those related to inter-municipal cooperation and the role of municipalities in PNMA.

That being said, the dummy variable **Partnership with the Private Sector** seeks to categorize those municipalities that sought to undertake environmental actions with the private sector as a type of alternative to municipal resource deficits, so that it is possible to infer whether this type of decision reduces the chances of horizontal cooperation partnerships or not. In the dummy variable **Metropolitan Area**, the variation in terms of Brazil's urban dynamics is recognized, and thus those municipalities that, during the period of analysis, belonged to one of the 74 established metropolitan areas were identified. Furthermore, given the considerable asymmetry between the municipalities in socioeconomic and demographic aspects, the base 10 logarithms of the IBGE population estimates (variable **Population**) and the GDP (variable **GDP *Per Capita***) were inserted.

Taking into account these criteria for data analysis, firstly, a descriptive analysis was performed in order to present the data set in a summarized manner, in addition to checking for the existence of possible abnormal behaviors in the distribution of variables. Then, to ensure that the prerequisite of multivariate analysis was met, that there is no high collinearity between the independent variables (Kellstedt & Whitten, 2015), a correlation analysis was conducted between the explanatory variables, thus identifying the degree of covariance present.

Finally, to identify the causal relationship between local capacities and inter-municipal cooperation, it was prepared and applied, based on the variables in Box 1, a logistic regression model, due to the fact that the dependent variable of the study is of categorical type, representing a dichotomy that is the classification between municipalities that cooperate and those that do not. In this sense, logistic regression is therefore the most appropriate technique for this type of situation (A. A. T. Fernandes et al., 2020; Hair, Black, Babin, & Anderson, 2009), since it allows estimating the predicted probability of a certain qualitative condition being met or not, according to the observed variation of the selected explanatory factors.

5. RESULTS AND DISCUSSION

The analysis employed in this paper starts with the presentation of a descriptive overview of the collected data contained in Table 1. Divided into two panels, the table describes the measures for all the research variables. Panel 1 presents the continuous variables, with the mean, median, standard deviation, and maximum and minimum values. In Panel 2, dummy variables are presented, with the number of municipalities belonging (1) and not belonging (0) to each category, as well as the corresponding percentage value.

TABLE 1 DESCRIPTIVE STATISTICS

Panel 1 – Continuous independent variables						
Variables	N	Mean	Median	Standard deviation	Minimum	Maximum
Workforce	4,749	0.97	0.50	1.56	0.02	28.30
Bureaucracy Autonomy	4,749	54.09	50.00	10.05	50.00	100.00
Fiscal Management	4,749	0.41	0.41	0.20	0.00	1.00
Council	4,749	3.29	1.00	4.42	0.00	48.0
Legislation	4,749	0.24	0.18	0.27	0.00	1.00
Population (Log10)	4,749	4.15	4.10	0.52	2.91	7.08
GDP Per Capita (Log10)	4,749	4.24	4.24	0.29	3.52	5.54

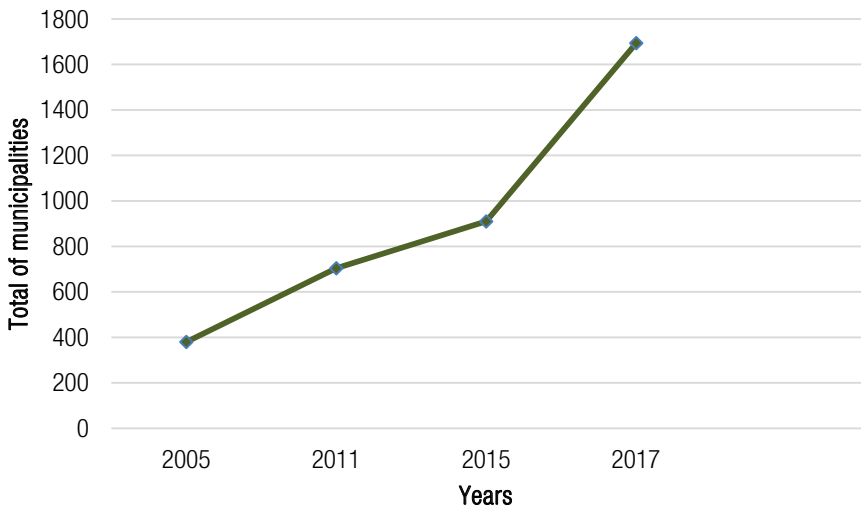
Continue

Panel 2 – Dummy independent variables			
Variables	**Category**	**N**	**%**
Cooperation	Yes (1)	1,499	31.6
	No (0)	3,250	68.4
Organizational Structure	Yes (1)	1,282	27
	No (0)	3,647	73
Environmental Planning	Yes (1)	2,699	56.8
	No (0)	2,050	43.2
Fund	Yes (1)	2,569	54.1
	No (0)	2,180	45.9
Partnership with the Private Sector	Yes (1)	372	7.8
	No (0)	4,378	90.2
Metropolitan Area	Yes (1)	1,188	25
	No (0)	3,561	75

Source: Elaborated by the authors.

Initially dealing with the dependent variable, Table 1 shows that there is relatively low participation in inter-municipal cooperation through public consortiums in the environmental sector, since out of the 4,479 municipalities analyzed, 1,664 are participants, which corresponds to only 31.6% of the total. The comparison of these values with the same data in previous editions of Munic indicates, according to Graph 1, that there is, over time, an expressive process of diffusion of this cooperative instrument. These results are in line with what is evidenced by Grin (2021), about the inductive effect of the consortia law as of 2005, and Leme (2016), regarding the gradual adhesion of municipalities to their attributions in local environmental management.

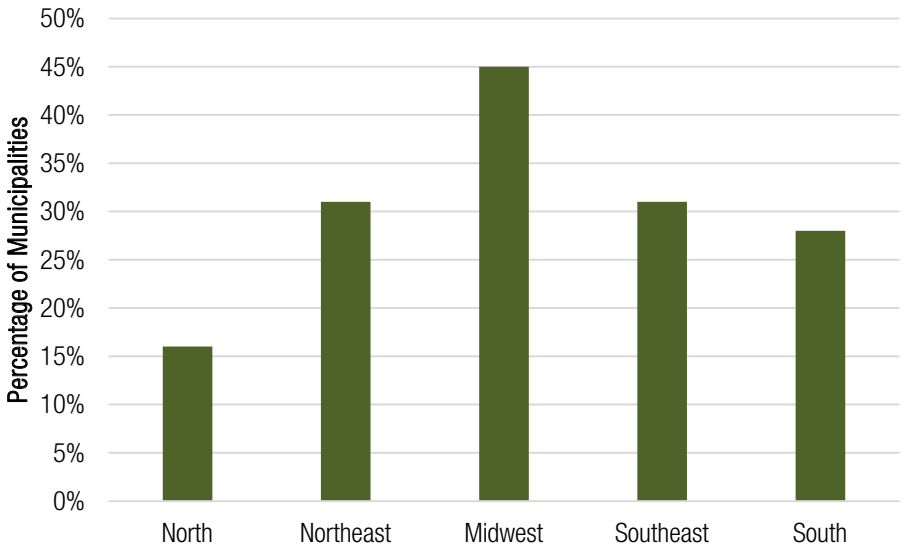
GRAPH 1 INTERMUNICIPAL PUBLIC CONSORTIUMS IN THE ENVIRONMENTAL SECTOR (2005-2017)



Source: Elaborated by the authors based on Munic surveys from 2005, 2011, 2015, and 2017.

Despite this growth in the participation in public consortiums in the environmental sector over the years, there are still important regional variations in the distribution of cooperating municipalities that deserve to be highlighted. As indicated by Graph 2, in the period analyzed by the research, the Midwest region is the one with the highest incidence of this inter-municipal cooperative arrangement, with 45% of its municipalities members of some environmental public consortium. The Southeast and Northeast regions come next, both with 31% of the municipalities that cooperate with each other. Just below, the South region has 28%, while the North has only 16% of cooperative members, being the region with the lowest incidence observed.

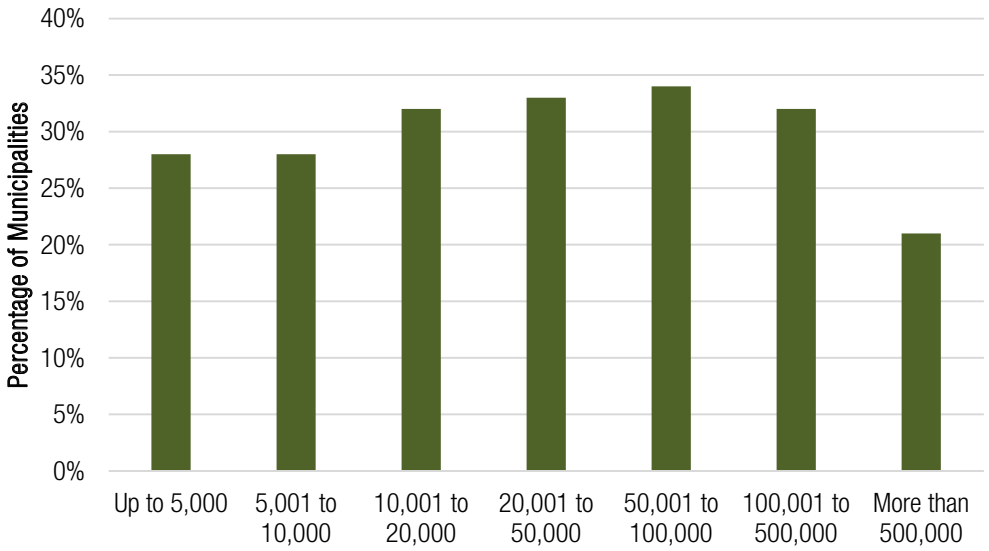
GRAPH 2 PUBLIC ENVIRONMENTAL CONSORTIUMS BY REGION



Source: Elaborated by the authors based on the 2017 Munic survey.

In addition to the variation at the regional level, there is also a variation in terms of population size. As shown in Graph 3, of all the municipalities in the country, environmental cooperation occurs to a greater degree and at a very close frequency in those with 10,001 to 20,000 inhabitants (32%); 20,001 to 50,000 inhabitants (33%); 50,001 to 100,000 (34%), and 100,001 to 500,000 (31.7%), which shows the concentration in the intermediate size group. At a lower level, we have the groups of up to 5,000 and 5,001 to 10,000 inhabitants, with 27.6% and 28% of the municipalities with cooperative status, respectively. And finally, as expected, the group with the lowest incidence of cooperation is the largest municipalities (more than 500,000 inhabitants), with only 21.9% frequency.

GRAPH 3 PUBLIC ENVIRONMENTAL CONSORTIUMS BY SIZE OF MUNICIPALITY



Source: Elaborated by the authors based on the 2017 Munic survey.

Regarding the variables related to local capacities, Table 1 shows that only 23% of the municipalities have a specific organizational structure for the environmental sector. The data indicate relatively satisfactory numbers when it comes to the autonomy of the bureaucracy in the environmental sector, since, on average, 54.1% of the bureaucratic body in this sector is made up of employees with a statutory employment contract. On the other hand, the measures in Table 1 for the **Workforce** variable, despite the considerable dispersion indicated by the standard deviation, point to a scenario in which the environmental department of the municipalities is composed of a reduced number of bureaucrats, with a ratio of less than one employee per thousand inhabitants. Therefore, it is understood that, despite the degree of autonomy of the bureaucracy observed, the administrative capacity of the municipalities in the environmental sector is still potentially compromised due to the low availability of human resources and an inadequate organizational structure.

As for technical capacity, the data in Table 1 show that 58.6% of the municipalities have an integrated plan for solid waste management. This, in other words, is an indication that planning is a characteristic present in more than half of the local environmental managements, which shows medium and long term perspectives in the subnational environmental agenda.

In terms of financial capacity, the data in Table 2 show that, during the period analyzed, the municipalities had low fiscal performance, with the mean value of the **Fiscal Management** variable for the set of observations being 0.41. In the midst of these numbers, it is possible to state that financing municipal management and, consequently, environmental management with their own resources is a first-order challenge for most municipalities. Table 1 also allows us to see that, despite this complex fiscal scenario, a little more than half (54.1%) of the cases analyzed have a specific fund with resources allocated to the environmental sector.

Regarding the political-relational capacity, it was found that municipal environmental councils had an average of 3.29 meetings per year. In this sense, there are municipalities where this social participation arena is stronger, with up to 48 meetings per year (maximum value), while there are others where there were no meetings during the year or where the council does not even exist.

For institutional capacity, it was found that the variable **Legislation** had a mean of 0.24 and a median of 0.18 (range 0-1), indicating that, in the period analyzed, municipalities had a more restricted environmental legislation, limited to regulate few issues at the local level. To this result, one can attribute the normative clash with other state or federal legislations on the same environmental subject or even the blurred notion of municipal territorial limits on a certain environmental subject (Leme, 2016), which could end up discouraging the making of new legislations.

From Table 1, it is still possible to verify that only 7.8% of the municipalities analyzed are in partnership with the private sector, and that 25.1% of them are in some metropolitan region. In parallel to this, minimum and maximum values for the variable **Population**, converted to logarithmic scale, reveal the extent of the analysis, since the set of observations is composed of municipalities ranging from Serra da Saudade (MG), with only 812 inhabitants and the smallest municipality in the country, to São Paulo (SP), the largest of the municipalities, with an estimated population of 12,106,920 inhabitants in 2017. Finally, Table 1 presents the values of municipal GDP *per capita*, also converted to a logarithmic scale of base 10. In this case, with less asymmetry than presented in the variable **Population**.

With the presentation of this descriptive overview, the degree of relationship between the continuous independent variables is addressed. It is noteworthy that this step of the analysis was carried out with the purpose of identifying possible multicollinearity problems that could cause bias for the logistic regression analysis (A. A. T. Fernandes et al., 2020), since explanatory factors such as fiscal management and municipal labor force may co-vary considerably, given the intrinsic relationship.

In Table 2, the values of the correlation coefficients for the selected variables are described, and, as observed, all are at the margin of the Hair et al. (2009) parameters for inexpressive correlations, even with most of them being statistically significant. Thus, the values expose the non-occurrence of multicollinearity above tolerable levels and certify the insertion of all variables in the logistic regression modeling.

TABLE 2 CORRELATION MATRIX OF QUANTITATIVE VARIABLES

-	Workforce	Bureaucracy Autonomy	Fiscal Management	Council	Legislation	Population (Log10)	GDP *Per Capita* (Log10)
Workforce	1						
Bureaucracy Autonomy	-0,004	1					
Fiscal Management	0,038**	-0,095**	1				
Council	-0,015	-0,028	0,181**	1			
Legislation	-0,040**	0,011	0,154**	0,251**	1		
Population (Log10)	-0,272**	-0,022	0,096**	0,357**	0,333**	1	
GDP *Per Capita* (Log10)	0,093**	-0,125**	0,584**	0,252**	0,192**	0,088**	1

**Significant correlation at the 0.01 level (both ends).
Source: Elaborated by the authors.

Following the presentation of the results, the logistic regression analysis is summarized in Table 3, where one can see which factors have influenced inter-municipal cooperation for the local implementation of the PNMA. Through this table, it is possible to note, firstly, that the values for the Hosmer and Lemeshow test signal a minimally adjusted model ($p > 0.05$). In addition, Nagelkerke's pseudo R2, as a reference measure for the model's explanatory capacity, reaffirms the multicausal character of the phenomenon of inter-municipal cooperation in the environmental sector. For even with a considerable number of variables inserted, the relatively low value of the coefficient (0.045) suggests that the environmental consortium is also predicted by another series of relevant aspects not included in the analysis.

TABLE 3 RESULTS FROM THE LOGISTIC REGRESSION MODEL

Dimension	Variables	β	Exp (β)
Administrative Capacity	Organizational Structure	-0,166** (0,074)	0,847
	Workforce	-0,050** (0,024)	0,951
	Bureaucracy Autonomy	-0,007** (0,003)	0,993
Technical Capacity	Environmental Planning	0,467*** (0,069)	1,596
Financial Capacity	Fiscal Management	-0,714*** (0,201)	0,490
	Fund	0,242*** (0,074)	1,274
Political-relational Capacity	Council	0,022*** (0,008)	1,023
Institutional Capacity	Legislation	0,492*** (0,129)	1,635
Control	Partnership with the Private Sector	-0,535*** (0,130)	0,586
	Metropolitan Area	-0,153** (0,079)	0,858
	Population (Log10)	-0,085 (0,075)	0,918
	GDP *Per Capita* (Log10)	0,224 (0,141)	1,251
-	Constant	-1,136* (0,679)	0,321
Model Adjustment			
Hosmer and Lemeshow's Test (8 gl)		8,73 (p = 0,366)	
Nagelkerke's Pseudo R^2		0,045	

Note: ***p < 0,01; **p < 0,05; *p < 0,1.
Note: Standard error in parenthesis.
Source: Elaborated by the authors.

When analyzing the influence of each explanatory variable, it is possible to notice that all of them present the desired sign in the causal relationship, being only the environment fund variable the one that presents an inverse sign. With the model results in mind, it is found, similarly to the discussions conducted by Hefetz, Warner, and Vigoda-Gadot (2014), Meza et al. (2019), and Morgan and Hirlinger (1991), that the lower the administrative capacity, the more likely the municipality is to cooperate with others in the environmental sector to compensate for its organizational and managerial shortcomings. More specifically, local governments may consider environmental consortia as a viable alternative when they identify that: a) without a specific secretariat, the environmental agenda can be co-opted by the agenda of another sectorial area (Leme, 2016); b) deficits in the workforce can compromise environmental management coverage; and c) the absence of stable links in the civil service can lead to high turnover, loss of *expertise*, and interference.

However, it should be said that, statistically, except for the presence of an organizational structure, the effect of the attributes **Workforce** and **Bureaucracy Autonomy** is relatively small on cooperation, since the estimated coefficient of β is close to 1.000 (null effect), which, in any case, does not make the analysis unfeasible. Thus, in terms of odds ratio, calculated here as *(Exp(β)-1) x 100)*, the existence

of an own organizational structure decreases the chances of cooperation by 15.3% and, for each unit increased in the **Workforce** and **Bureaucracy Autonomy** variables, the chances decrease by 4.8% and 0.7%, respectively.

Technical capacity, on the other hand, proved to be a characteristic that matters for interlocal cooperation to occur. Thus, according to Table 3, the existence of an environmental planning instrument in the municipal public administration presented statistical significance, besides also representing a 59.6% increase in the odds ratio for participation in public environmental consortia. This result is in line with what was discussed by Feiock (2007), indicating that, even in low workforce scenarios, environmental planning can be integrated with cooperation, since it potentially reduces some uncertainties about the technical contribution of municipalities to the consortia. Another possible implication of this result is the federal induction based on conditional voluntary transfers for the construction of integrated and cooperative environmental planning in matters such as solid waste management (Klein, Gonçalves-Dias, & Olivieri, 2020).

Regarding the Financial Capacity axis, the results shown in Table 3 indicate that the municipalities that cooperate with others in the environmental sector are, in general, those with lower fiscal performance, in line with some literature findings (Bel et al., 2013; Di Porto & Paty, 2018; Leroux & Carr, 2007; Strebel & Bundi, 2022). Dealing with the odds ratio, for each increment in the index of the **Fiscal Management** variable, the probability of the municipality cooperating with others in the environmental area decreases by 47.3%. However, contrary to the initial expectations of the study, it is noticeable, based on the estimated coefficients of β (**Fund** variable), that the existence of a municipal environmental fund is a factor that exerts a positive influence on cooperation, increasing by 28.5% the probability of the city being a participant in environmental consortia. As the environmental funds can be composed of different sources of governmental revenue (Carvalho et al., 2005) and Munic's data does not make clear the origin of the resources, on this unexpected result it can be hypothesized that most of these funds have their composition based more on federal/state transfers than on their own resources. Besides, there is another explanatory path that refers to the decision-making control of the allocation of the funds' resources, since, in some municipalities, the deliberation of the application of resources can be done directly by the municipal environmental councils (Leme, 2016).

For the political-relational dimension, the results indicate that the existence of a municipal environmental council with more meetings throughout the year positively influences the occurrence of cooperation. In other words, on average, for each additional meeting held, the odds ratio increases by 2.3%. Since the environmental policy configures a broad arena with different actors and interests (Neves, 2012), this result shows that, as social demands are institutionalized, the performance of environmental councils as consolidated mechanisms of participation and social control (Carvalho et al., 2005; Leme, 2016) tends to be taken into account by local governments, influencing, to some extent, decisions about the implementation of environmental policy following a cooperative model with other governments.

Finally, in the institutional capacity dimension, the more complex and comprehensive the environmental legislation is, the more likely it is that cooperation will occur at a local level. Therefore, those municipalities that regulate more environmental issues than others are, in general, participants in public environmental consortia, since they end up having more exclusive competencies and

allocate more municipal resources for their actions. In the sense of the odds ratio, for each one unit increase in the **Legislation** variable, the probability of the municipality cooperating with the consortium grows by 63.5%.

In order to continue the analysis, it was verified that the control variables **Population** and **GDP *Per Capita*** do not present statistical significance to the regression model. However, the control variables **Metropolitan Region** and **Partnership with the Private Sector** presented themselves as statistically significant. With these results, it is attested, from the same perspective of other studies (Hefetz & Warner, 2011; Mello & Lago-Peñas, 2013), that smaller and less urbanized Brazilian municipalities cooperate less in the environmental area, since the vast majority of them have the metropolitan status. In addition, it was also found that, when there is low operational capacity, the pursuit of environmental actions through the private sector can be seen as a viable alternative to cooperation, especially if these municipalities have a tradition of such arrangements. As Brown, Potoski, and Van Slyke (2008) point out, public service delivery models are trajectory dependent, and the future possibilities of changing to a new model, such as the cooperative one, with other municipalities, are complex.

Amidst these results, it is reasonable to consider that, in the local implementation of PNMA, state capacity is a relevant municipal characteristic associated with participation in public consortia. It is interesting to note, beyond this confirmation of empirical association between the concepts, that different types of capacity generate different effects and results on the structure of a given public policy, something already seen in works such as that of Pires and Gomide (2016), for example.

In summary, accumulated resources of a fiscal and organizational nature possibly enter into the rational calculations of decision makers, when they compare potential political costs and benefits when undertaking collective actions aimed at promoting the environment. On the other hand, in a scenario of lack of resources, the elements that configure the technical, political-relational, and institutional capacity may represent the configuration of a local environmental agenda more open to innovations that make it possible to mitigate deficits in operational capacity, as is the case of public consortia.

Moreover, the statistical analysis employed signaled that, for comparison purposes, inter-municipal cooperation for the implementation of the PNMA tends to be explained more by the availability of technical, political-relational and institutional capacity than by the absence of resources related to administrative and financial capacity. Despite the statistically significant association, variables such as the workforce and autonomy of the bureaucracy presented a modest relationship with the likelihood of cooperation for municipalities, while the association with financial capacity was only moderate and partial, since the variable related to environmental funds presented an unexpected causal relationship. That said, what could be observed is that factors such as environmental planning, council action, and environmental legislations presented a more robust explanatory relationship in the analysis.

7. CONCLUDING REMARKS

This paper sought to discuss the relationship between state capacities and cooperative actions in decentralized policies, considering assumptions consolidated in the literature regarding how certain municipal characteristics matter and may be causal mechanisms of the phenomenon of inter-municipal cooperation.

In the specific case of Brazilian environmental policies, there have been gradual advances in the definition of municipal roles and responsibilities, together with incentives for intergovernmental cooperation. However, we acknowledge that, in the institutional arrangement of Sisnama and, consequently, of PNMA, the municipalities are the entities with the least developed state capacity, although there has been a slight tendency for an uneven expansion of this capacity over the last few years. In a scenario marked by federal asymmetries and nationally standardized guidelines, cooperation emerges as one of the main alternatives for local administrations to mitigate the difficulties in implementing environmental policy.

In light of these issues, the objective of the paper was to identify whether the administrative, technical, financial, political-relational and institutional capacity of Brazilian municipalities are characteristics associated with participation in inter-municipal public consortia in the environmental sector. For this, a quantitative study was developed with 4,479 municipalities in the country. Based on a logistic regression model, the research estimated variables that measure participation in public consortiums (proxy for inter-municipal cooperation), the workforce, bureaucracy autonomy, fiscal performance, environmental investment capacity, the performance of municipal environmental councils, environmental planning, and environmental legislation. Socioeconomic, demographic, and institutional variables were also included in the analysis for control purposes.

The results show, in general terms, that: 1) there is a slight negative association between administrative capacity and cooperation; 2) a negative and moderate association between fiscal performance and cooperation; and 3) a positive and expressive association between cooperation and technical, political-relational, and institutional capacity. In other words, the analysis shows that municipalities with less financial and administrative capacity are more likely to engage in inter-municipal public consortia to implement the PNMA and, therefore, to deepen intergovernmental cooperation in the sector. This is a finding that corroborates the studies of A. S. A. Fernandes et al. (2020), complementing the discussion on consortia for the maintenance and generation of public assets in the Brazilian reality.

In contrast, the analysis shows that municipalities with greater technical, political-relational and institutional capacity increase the incidence of this type of cooperative arrangement in Brazilian environmental policies. This finding indicates that, even in scenarios of lack of operational resources, the institutionalization of an environmental agenda in the municipality has the potential to boost the cooperative behavior of local governments in defense of the environment, doing justice to what is expected of municipalities in the current configuration of Sisnama.

In summary, it can be concluded that the lack of administrative and financial capacity is not necessarily the main condition for municipal public administrations to implement the PNMA cooperatively. As discussed, different types of capacity generate different incentives for decision makers and, in the case of municipal environmental policy, it is of the utmost importance to also

consider that the insertion of the matter on the local government agenda - evidenced by the existence of institutionalized planning, the activism of local councils and the prevalence of municipal legislation - constitutes a promising explanatory mechanism for the use of inter-municipal public consortia as a viable alternative.

Despite contributing to the academic debate with these results, we acknowledge some limitations in the research. First, it should be emphasized that the use of secondary data does not always permit a full measurement of concepts, as was the case here with the specialization of the local bureaucracy, another important aspect of administrative capacity. Furthermore, because of the research design and the *cross-section* approach employed, the study did not allow for more assertive causal inferences about the effects of state capacities on the decision to cooperate or not, since it is limited to establishing causal relations in a specific time frame.

Finally, future studies can focus in greater depth on the development of the environmental agenda in consorted municipalities and to what extent this local context affects the emergence of these cooperative arrangements. Overall, the analysis undertaken here has shown that the concept of state capacities, in its various forms, is an element of paramount importance to the understanding of intergovernmental cooperation. It is hoped, therefore, that this finding will broaden the investigative horizon and the range of evidence for understanding intergovernmental cooperation in the distinct institutional designs of public policies in Brazil.

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