

Evolution of the institutional capacity of the São Paulo Metropolitan Region in relation to climate change

Evolução da capacidade institucional da RMSP em relação às mudanças climáticas

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Abstract

This article proposes a methodology of analysis of the institutional capabilities that are employed to cope with climate change at the municipal and metropolitan levels. The methodology was applied to the São Paulo Metropolitan Region using Environmental and Disaster Risk Management data, collected by the Brazilian Institute of Geography and Statistics (IBGE) through the National Survey of Municipal Information (MUNIC), years 2013, 2017, and 2020. The results indicate that municipal institutions consistently lost capabilities to cope with climate change between 2013 and 2020. There is a considerable difference in the pattern of this loss when the analysis focuses separately on institutional capacity to deal with environmental management and with disaster risk management.

Keywords: institutional capacity; climate change; environment; risk management; indicators.

Resumo

Este artigo propõe uma metodologia de análise das capacidades institucionais de enfrentamento das mudanças climáticas em âmbito municipal e metropolitano. A metodologia foi aplicada na Região Metropolitana de São Paulo (RMSP), utilizando os dados relativos a Meio Ambiente e Gestão de Riscos, da Pesquisa Nacional de Informações Municipais do IBGE (Munic), edições de 2013, 2017 e 2020. Os resultados indicam perda consistente das capacidades institucionais de enfrentamento das mudanças climáticas entre 2013 e 2020. Há uma diferença considerável no padrão dessa perda quando a análise incide separadamente sobre a capacidade institucional para lidar com os temas da gestão ambiental e da gestão de riscos de desastres.

Palavras-chave: capacidade institucional; mudanças climáticas; meio ambiente; gestão de riscos; indicadores.



Introduction

The fulfillment of goals for climate change fighting requires a great institutional effort, and this need is mentioned in the International Panel of Climate Change (IPCC) Assessment Report Six (AR6), which emphasizes the necessity to build institutional and governance capacity for climate change mitigation in urban areas (IPCC, 2022, p. 44).

By mentioning the idea of institutional capacity, North (1990) emphasizes the importance of establishing differences between institutions and organizations in the context of the new institutional economy: institutions are society's own rules of the game, providing spaces for social, political, and economic exchange, and have done this through three specific characteristics: the formal rules, the informal practices and the development of mechanisms for these rules to be applied (*ibid.*). On the other hand, organizations comprise groups of individuals (process agents) linked by everyday purposes to achieve goals. The difference between institutions and organizations is defined as follows: "The purpose of the rules is to define the way the game is played. But the objective of the team within that set of rules is to win the game - by a combination of skills, strategy, and coordination; by fair means and sometimes by foul means. Modeling the strategies and the skills of the team as it develops is a separate process from modeling the creation, evolution, and consequences of the rules" (*ibid.*, pp. 4-5). In this way, the idea of the institution seems more appropriate for this article because organizations are not institutions "of society"

but "groups within society" (Boliari, 2007), which is an excellent argument to define the institution-related approach as more suitable for describing state groups, whose objectives are the optimization of existing resources and better allocation of these resources in society (Ostrom et al., 1999).

The concept of institutional capacity is used to describe how much an institution is capable of delivering products or results (Mizrahi, 2003) and encompasses other related concepts, such as institutional building, institutional reinforcement or strengthening, organizational capacity, and organizational development (Lessik and Michener, 2000). Another critical approach is developed by Brown, Lafonde, and Macintyre (2001), which proposes an analysis of institutional construction from a systemic perspective. In their approach, institutions are defined as a system subject to influences, fed back by inputs and outputs, critical to measuring the flows and results of the processes to which institutions are subjected.

In the scientific debate about climate change, some authors (Dacin, Goodstein, and Scott, 2002; Scott et al., 2000; Gupta et al., 2010) show that the adaptive capacity of institutions to face climate change can be measured using indicators focused on their governance. Although there are qualitative scientific studies on the subject – based on semi-structured interviews (Mundim et al., 2019; Costa, 2020) and literature review (Fernandes, 2016) -and also research using disaggregated data from the Brazilian Institute of Geography and Statistics (IBGE, in the Portuguese acronym) – the Municipal

Basic Information Survey (Munic, in the Portuguese acronym) (Leme, 2016) –, there is a gap regarding the institutional capacities to cope with climate change, expressed in the lack of studies regarding systematization methodologies that measure institutional capacities, at the municipal and metropolitan level, through quantitative and synthetic indicators.

This article aims to fill part of this scientific knowledge gap by proposing a methodology for measuring institutional capacity in relation to the Sustainable Development Goal (SDG) number 13 (Climate Action). Based on the institutional functions' typology proposed by Lessik and Michener (2000), the developed methodology includes data visualization in a two-dimension model, with institutional functions and the dimensions of these functions. The article creates an institutional capacity classification based on the Munic-IBGE data valuation.

The comparative analysis of Munic-IBGE data for the 2013, 2017, and 2020 editions enhanced the verification of whether the institutional capacity to meet the goals of SDG 13 increased or decreased between the three referred surveys. The methodology targeted the São Paulo Metropolitan Area (SPMA) context, a region with 22 million people (IBGE, 2021) distributed by 39 municipalities in 7.946 square kilometers.

The article is structured in another four sections. The following section introduces the methods developed, the concepts and data used, the analysis period, and other

information. Then we share the results of institutional capacity analysis, in metropolitan scope, through quantitative indicators. The third section discusses the findings. Finally, we highlight the main conclusions and suggestions for future studies on the theme.

Methods

This section is organized according to the following sequence. First, the theoretical approach that supported the selection and collection of data for analyzing institutional capacity is presented. Then, the procedures for data analysis are described. Finally, the composition of the indicators and the data visualization methodology are exposed. Figure 1 summarizes the methodological research steps.

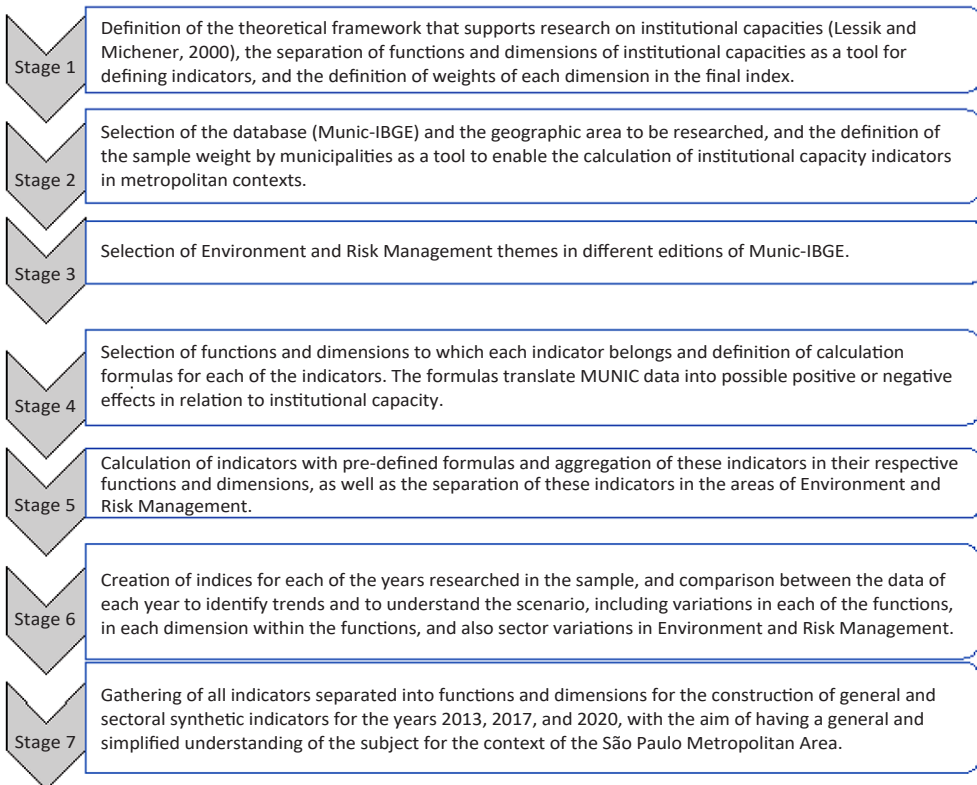
Theoretical approach: institutional functions and function dimensions

Regarding data collection and analysis, it should be noted that the indicators were built according to the Lessik and Michener (2000) (Chart 1) model of institutional capacity indicators. The choice of this analysis model is motivated by the coverage of the model and its easy applicability in systemic models, considering the field of Earth System Science (Steffen et al., 2020). The functions, their dimensions, and their respective descriptions are summarized in Chart 1:

Based on this theoretical approach, this article selected the Munic-IBGE survey indicators according to the institutional function typology of Lessik and Michener

(2000). Then, the data visualization was presented in a two-dimension model, embracing the institutional functions and their dimensions.

Figure 1 – Stages of Research



Source: prepared by the authors.

Chart 1 – Institutional Functions

Functions	Description	Function dimensions
Administrative and support	Allow the daily viability of the organization so that the other functions are well performed to fulfill the organizational mission	(1) Administrative procedures and management systems (2) Financial management (budgeting, accounting, fundraising, sustainability) (3) Human resource management (staff recruitment, placement, support) (4) Management of other resources (information, equipment, infrastructure)
Technical/ Program	The purposeful work of the organization, which relates to the purpose of its existence. They are the reason why the organization exists as a structure with roles and resources	(1) Service delivery system (2) Program planning (3) Program monitoring and evaluation (4) Use and management of technical knowledge and skills
Structure and culture	Functions that are not end activities (technical and programs) or means (administrative and support) but are the set of assumptions that define how these activities should be carried out and the impact these activities generate	(1) Organizational identity and culture (2) Vision and purpose (3) Leadership capacity and style (4) Organizational values (5) Governance approach (6) External relations
Resources	The necessary inputs for the functioning of an organization: budget, employees with different specializations, labor division, conditions for carrying out the tasks, and the political viability of the organization	(1) Financial (2) Human (3) Other

Source: prepared by the authors, based on Lessik & Michener (2000).

Data collection

The database was obtained through Munic, a municipal research survey comprising thematic questionnaires administered by IBGE since 2001. The Munic is, accordingly to Jannuzzi (2002), a study that focuses more on input or process indicators than output ones. The Munic scope is unique in this aspect, especially after 201, when its questionnaire began to follow an evaluation logic closer to that of the SDGs: “The survey provides varied information on municipal public management, including

(...) sectorial public policies within the scope of the researched areas (housing, transport, agriculture, environment, etc.), among other aspects” (IBGE, 2022). The use of Munic as a follow-up and monitoring tool for public policies makes it possible to understand the organization and institutionalization of programs and projects in municipal administrations. Also, it subsidizes the diagnosis of the reality on which these policies act and the evaluation of priorities contained in public interventions (Pacheco, 2020).

The most recent editions of Munc (2013, 2017, and 2020) have had greater adherence to the indicators and targets of SDG 13, with specific surveys carried out with municipal managers on the themes of environmental management and disaster management (Chart 2). The other Munc editions – 2001, 2002, 2004, 2005, 2006, 2008, 2009, 2011, 2012, and 2015 – addressed the topic in a tangential and non-systematized way, and from 2015 onwards, the two themes started to make up the matrix of SDG 13 indicators.

To verify the capacity of the institutions regarding the environment and disasters in the SPMA, indicators were calculated for the years 2013, 2017, and 2020. Chart 2 and Table 1 show that the increase in priority of environmental and disaster risk management issues at

Munc was incremental, with a more detailed thematic analysis within the questionnaire from the 2013 survey. Moreover, the indicators used were comprehensively separated. This means that an indicator can influence more than one dimension or function. This said, the number of indicators used for the results in each dimension was more significant than the sum of indicators verified in Box 2, as seen in Table 1. The supplementary material we made available (Github, 2023) details each of the Munc variables used according to the dimensions of the function assigned to them. Munc is a survey carried out using the Papi technique – pen and paper personal interview, which uses a pre-defined questionnaire with closed questions (IBGE, 2023) – making it possible to attribute value to the indicators

Chart 2 – Questions in the Munc survey with adherence to SDG 13 indicators

Year	Environment	Risk management
2001	5	1
2002	10	1
2004	7	1
2005	10	0
2006	0	7
2008	33	0
2009	21	0
2011	8	0
2012	7	1
2013	39	171
2015	6	0
2017	107	132
2020	107	159

Source: elaborated by authors

based on the answers to each question. With this, the formula for calculating the indicators was defined. Each question was evaluated, and the indicator would be assigned a positive

weight if the answer was considered positive for institutional capacity building. If the answer were deemed harmful to institutional capacity, the indicator would be given a negative weight.

Table 1 – Number of indicators by function dimension

Functions	Functions dimensions	Munic 2013			Munic 2017			Munic 2020		
		Total	Risk management	Environment	Total	Risk management	Environment	Total	Risk management	Environment
1. Administrative and support	1.1 Administrative procedures and management systems	30	22	8	44	17	27	71	44	27
	1.2 Financial management (budgeting, accounting, fundraising, sustainability)	14	7	7	66	17	49	99	50	49
	1.3 Human resource management (staff recruitment, placement, support)	17	9	8	44	17	27	71	44	27
	1.4 Management of other resources (information, equipment infrastructure)	63	50	13	134	93	41	151	109	42
2. Technical/program	2.1 Service delivery system	83	78	5	149	98	51	205	149	56
	2.2 Programs planning	81	65	16	131	92	39	174	134	40
	2.3 Program monitoring and evaluation	32	19	13	63	20	43	85	38	47
	2.4 Use and management of technical knowledge and skills	22	18	4	21	8	13	44	30	14
3. Structure and culture	3.1 Organization identity and culture	35	23	12	79	29	50	111	57	54
	3.2 Vision and purpose	26	8	18	56	17	39	87	44	43
	3.3 Leadership capacity and style	25	8	17	55	17	38	86	44	42
	3.4 Organizational values	33	23	10	45	17	28	76	44	32
	3.5 Governance approach	18	8	10	45	17	28	76	44	32
	3.6 External relations	47	26	21	94	33	61	127	62	65
4. Resources	4.1 Financial	10	5	5	51	17	34	82	44	38
	4.2 Human	11	5	5	23	17	6	51	45	6
	4.3 Other	28	8	20	90	33	57	132	71	61
Total		575	383	192	1.190	559	631	1.728	1.053	675

Source: prepared by the authors.

Chart 3 – Sample weight per population municipalities

Sample weight	Population	Number of municipalities
1	Up to 5,000	0
2	From 5,001 to 10,000	0
3	From 10,001 to 20,000	3
4	From 20,001 to 50,000	3
5	From 50,001 to 100,000	6
6	From 100,001 to 500,000	22
7	More than 500,000	5

Source: Database – Munic (IBGE).

Data analysis, the composition of indicators, and visualization methodology

The classification of municipalities by population size was developed for the 2010 Census (IBGE, 2013) and remained the agency's standard for dividing cities according to the resident population. In this article, the IBGE classification by population size was used as an instrument to define the weights of each municipality in the SPMA in the sample, using values from 1 to 7 to minimize possible distortions. As shown in Chart 3, among the 39 cities in the SPMA that exist in the IBGE database, three have a population of between 10 and 20 thousand inhabitants; three with a population between 20 and 50 thousand; six with a population between 50 and 100 thousand; 22 with a population between 100 and 500 thousand inhabitants; and five with a population over 500,000 inhabitants.

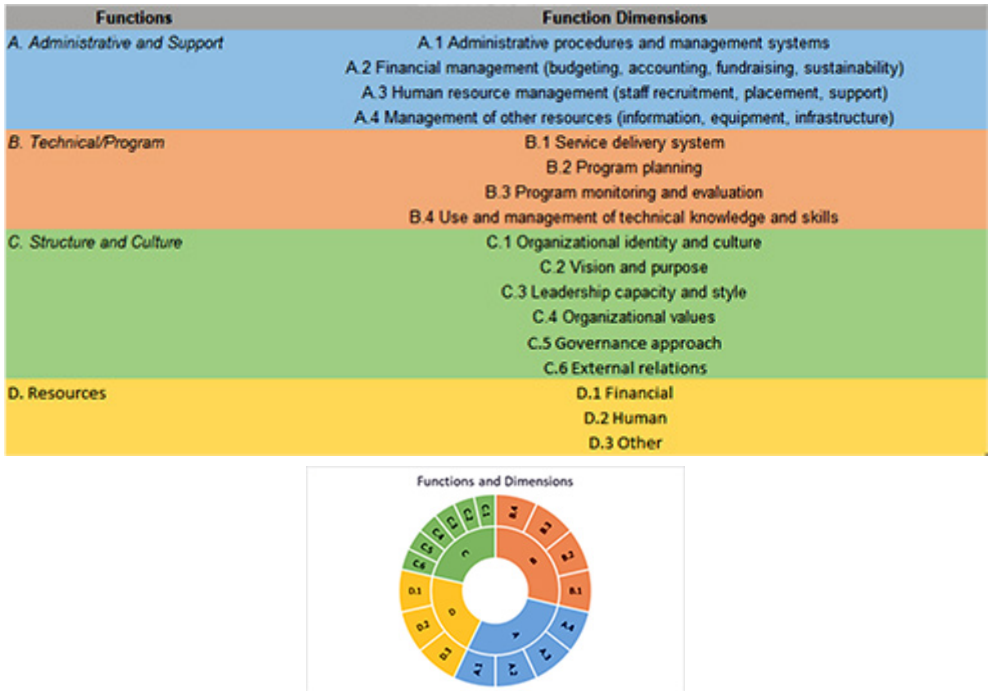
The data analysis methodology results from the table of institutional functions, in which the indicators were separated by theme

within the context of Munic questions (Table 1), with the weight of municipalities weighted within the IBGE logic of classification of cities by size (Chart 3). The supplementary material on the indicators, organized by the authors to promote future analyses (Github, 2023), details this methodology.

Data visualization was based on Gupta et al. (2010) model, using the “adaptative capacities wheel” with two dimensions of indicators (one more general and one more specific). This was implemented to permit a better comprehension of institutional strengths and weaknesses in a particular geographical space, like the description contained in Figure 2.

The functions and dimensions were defined according to the classification of Lessik and Michener (2000), authors who mapped which functions were repeated and meaningful in a universe of organizations of different types and, within these functions, which were the representative dimensions.

Figure 2 – Dimensions and functions to measure institutional capacity



Source: elaborated by the authors, based on Lessik and Michener (2000) and Gupta (2010).

A framework of institutional functions and dimensions was created, which, although not a general representation, is representative of most existing institutions. With this framework, it was possible to promote thematic separation and measure the institutional capacities to act concerning SDG 13. The institutional effects measured are shown in Chart 4. For better

visualization of the data, it was pre-established that the “negative effect” would be described in red color; “discrete negative effect” would be characterized in orange, “neutral effect” would be described in yellow, “discreet positive effect” would be marked with light green color; and “positive effect” would be characterized with dark green color.

Chart 4 – Measured institutional effects

Institutional effects on SDG 13 related Policies	Score limit	Aggregate scores in the different dimensions and functions analyzed
Positive effect	2	1.01 a 2.00
Discrete positive effect	1	0.01 a 1.00
Neutral effect	0	0
Discrete negative effect	-1	-0.01 a -1.00
Negative Effect	-2	-1.01 a -2.00

Source: elaborated by authors.

Table 2 – Weight of institutional capacities dimensions

Functions	Number of dimensions	Weight of each dimension	Percentage of total – %
Administrative and support	4	1	28.57
Technical/program	4	1	28.57
Structure and culture	6	0.5	21.43
Resources	3	1	21.43

Source: elaborated by authors.

Finally, it was necessary to weigh the weight of each dimension of institutional capacity so that the number of dimensions existing in each function did not distort the results of the calculation of institutional capacity as a whole. The result can be seen in Table 2.

Results

The themes of environment and risk management gained prominence within the context of the construction of the Munic

from its 2013 edition onwards, indicating a greater inclusion of these themes in the public policy agenda setting at the federal level. The IBGE survey reflects the consolidation of international policies related to climate change, especially after the Paris Agreement, the UN Sustainable Development Goals, and the Sendai Framework for Disaster Risk Reduction, all signed in 2015.

The composition of indicators of the institutional capacity of municipalities to face climate change can be an essential element for the formulation, planning, and implementation of public policies on the subject, as well as

for their monitoring over time. The following subsections discuss the 2013, 2017, and 2020 results based on a pilot study for the São Paulo Metropolitan Area (SPMA).

The institutional capacity of the SPMA for disaster management and climate change

Institutional Capacity in 2013

For 2013, the scenario was one of relative institutional consolidation of sectoral policies that, two years later, would become the policies covered by SDG 13. In all four functions

and 17 dimensions addressed, institutions showed “positive effects,” with values from one to two in Box 5, or “discrete positive effects,” with values from zero to one in the table on policies (Chart 5).

A more positive institutional effect on administrative and support functions is notorious, which indicates that the areas which provide support for better-quality services were well structured in 2013. Among the 17 dimensions, the “administrative procedures and management systems” dimension showed a positive highlight, which indicates the high quality of support services. In other functions, the dimensions that stood out were the “governance approach” (“structure

Chart 5 – Munic 2013 Indicators for analysis of institutional capacity to face the SDG 13

Functions	Function dimensions	Munic 2013
1. Administrative and support	1.1 Administrative procedures and management systems	1.282722
	1.2 Financial management (budgeting, accounting, fundraising, sustainability)	0.965596
	1.3 Human resource management (staff recruitment, placement, support)	0.862655
	1.4 Management of other resources (information, equipment, infrastructure)	0.912844
2. Technical/ Program	2.1 Service delivery system	0.511827
	2.2 2.2 Program planning	0.539189
	2.3 Program monitoring and evaluation	0.336153
	2.4 Use and management of technical knowledge and skills	0.506047
3. Structure and Culture	3.1 Organizational identity and culture	0.382045
	3.2 Vision and purpose	0.587685
	3.3 Leadership capacity and style	0.630642
	3.4 Organizational values	0.436892
	3.5 Governance approach	1.027268
	3.6 External relations	0.275913
4. Resources	4.1 Financial	1.252752
	4.2 Human	0.973728
	4.3 Other	0.342562

Source: elaborated by authors from the analysis of Munic’s 2013 database.

and culture” function), which signaled investment in modernization and increased transparency in policies in the area, and the dimension of “financial” (“resources” function), demonstrating that had a prominent role within the public budget in that period.

Institutional Capacity in 2017

For the 2017 year, an essential change in the pattern is noticeable, which signals a deterioration in the institutional capacities of the municipalities in the SPMA to deal with SDG 13. None of the functions or dimensions surveyed showed “positive effects” – between one and two – and only in one of the four

functions addressed (that of “resources”) did institutions show “discrete positive effects” – between zero and one. In the other functions, institutions started to show “discrete negative effects” – between minus one and zero – on policies related to SDG 13. These changes can be seen in Chart 6.

The only function that maintained a “discrete positive effect” as a standard was that of “resources,” especially in the dimensions of “financial” – which demonstrates that in 2017, despite the general worsening of the indicators, there was still some budgetary priority for the themes – and that of “Other” which indicates, for example, that there were still ongoing

Chart 6 – Munic 2017 indicators

Functions	Function Dimensions	Munic 2017
1. Administrative and support	1.1 Administrative procedures and management systems	-0.24465
	1.2 Financial management (budgeting, accounting, fundraising, sustainability)	-0.09550
	1.3 Human resource management (staff recruitment, placement, support)	0.54573
	1.4 Management of other resources (information, equipment, infrastructure)	-0.30183
2. Technical/ program	2.1 Service delivery system	-0.25905
	2.2 Program planning	-0.22266
	2.3 Program monitoring and evaluation	-0.29139
	2.4 Use and management of technical knowledge and skills	-0.18581
3. Structure and culture	3.1 Organizational identity and culture	-0.11370
	3.2 Vision and purpose	-0.13578
	3.3 Leadership capacity and style	-0.12599
	3.4 Organizational values	-0.12599
	3.5 Governance approach	-0.35604
	3.6 External relations	0.00000
4. Resources	4.1 Financial	0.18987
	4.2 Human	-0.38349
	4.3 Other	0.34256

Source: prepared by the authors from the analysis of Munic’s 2017 database.

inter-institutional partnerships, favoring the progress of public policies. In addition, in the “administrative and support” functions, the “human resource management” dimension stands out. Despite the deterioration of policies, many qualified professionals remained in municipal administrations working on sectoral policies. And finally, in the “structure and culture” function, the dimension of “external relations” remained neutral, which signals a scenario in which relations between public authorities and the community, through mechanisms of participation such as councils, remain in progress despite the dismantling of programs and sectoral policies.

Institutional Capacity in 2020

For the 2020 year, the deterioration of municipal institutional capacities in the SPMA to build policies that address the goals of SDG 13, which was already a trend in 2017, has intensified. In all four functions analyzed, institutional policies start to have “discrete negative effects” – between minus one and zero – concerning the targets of SDG 13. This effect can be identified in Chart 7.

The dimension “Management of other resources (information, equipment, infrastructure)” of the Administrative and Support function was the only one in which

Chart 7 – Munic 2020 indicators

Functions	Function Dimensions	Munic 2020
1. Administrative and support	1.1 Administrative procedures and management systems	-0.29771
	1.2 Financial management (budgeting, accounting, fundraising, sustainability)	-0.38254
	1.3 Human resource management (staff recruitment, placement, support)	-0.27820
	1.4 Management of other resources (information, equipment, infrastructure)	0.19855
2. Technical/ program	2.1 Service delivery system	-0.30884
	2.2 Program planning	-0.41464
	2.3 Program monitoring and evaluation	-0.17118
	2.4 Use and management of technical knowledge and skills	-0.44037
3. Structure and culture	3.1 Organizational identity and culture	-0.25151
	3.2 Vision and purpose	-0.29832
	3.3 Leadership capacity and style	-0.29539
	3.4 Organizational values	-0.23684
	3.5 Governance approach	-0.23684
	3.6 External relations	-0.26620
4. Resources	4.1 Financial	-0.38924
	4.2 Human	-0.54038
	4.3 Other	-0.26036

Source: prepared by the authors from the analysis of Munic’s 2020 database.

institutions continued to exert “discrete positive effects” on policies. This may be an indication that institutions, when harassed, seem to have information and infrastructure as mechanisms to try to convince society that the issues addressed should be prioritized on public policies, not only through communication strategies but also for the willingness to keep infrastructures in operation in an adverse scenario, in which many of these infrastructures were dismantled.

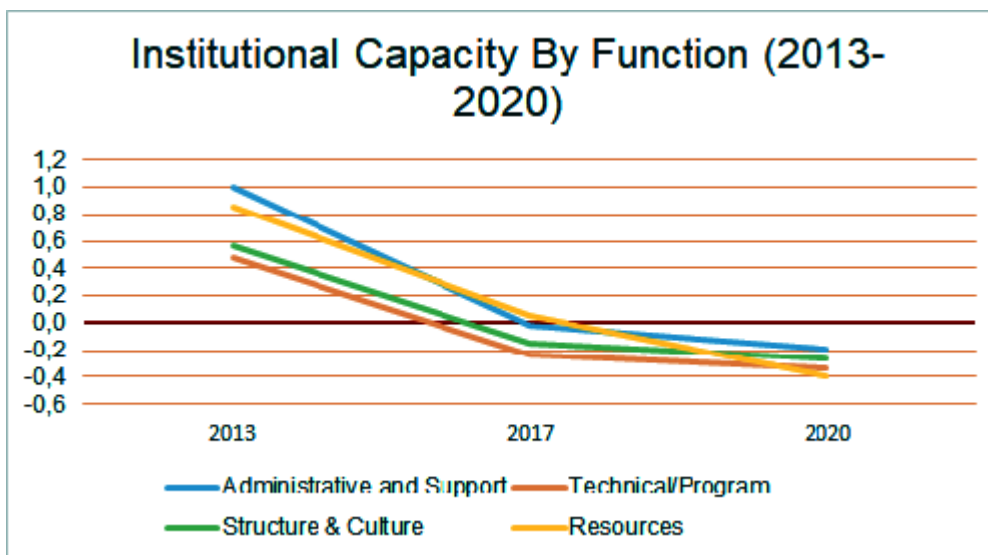
Finally, in a longitudinal analysis of institutional capacity concerning SDG 13 in SPMA, it was possible to verify, in the period between 2013 and 2020, the deterioration of the institutions' capacity in all functions analyzed (Figure 3). Although the results of the indicators in all functions have gone through processes of decay, it is possible to notice

that this process took place in different ways among the various institutional functions. The “resources” function suffered more significant losses between 2017 and 2020 than the other functions, which suggests that the process of institutional deterioration in this period culminated in the loss of budgetary investment and the interruption of training programs for qualified labor to deal with themes related to tackling climate change in municipalities.

Sectorial analysis of institutional capacity in relation to SDG 13 in SPMA

To try to understand whether the degradation of institutional capacity in the SPMA had more specific characteristics not captured in the general survey, the dimensions of the themes

Figure 3 – Longitudinal analysis of institutional capacity by type of function (2013-2020)



Source: prepared by the authors.

of “risk management” and “environment” were separated. To carry out the calculations of these two sectoral indicators, the Munic questions related to the themes of “environment” and “risk management” were separated in the 2013, 2017, and 2020 editions (in the Munic, there are separate questions for the themes of “risk management” and “environment”). The results related to “risk management” were obtained using the universe of inquiries related to the topic in the surveys mentioned above, and the same process occurred about the theme of “environment,” which provided the separation of the general result of the study into two equally relevant partial results.

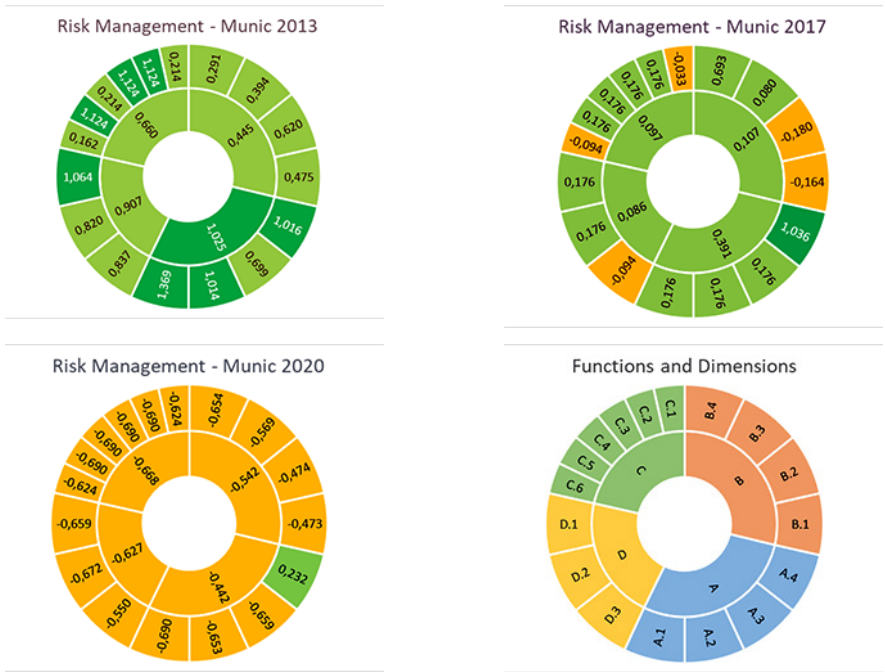
In the item “risk management” (Figure 4), there was a gradual movement of degradation of institutional capacities. The 2013’s policies were much more institutionalized than in 2017, and this script was repeated between 2017 and 2020. The exception, as in the general analysis, was in the dimension of “management of other resources (information, equipment, infrastructure)” in the Administrative and Support function, which was the only dimension in which the institutional effects remained positive in the 2020 survey about the theme of “risk management.”

The institutional capabilities wheel should be read according to the model in Figure 2: the inner part concerns functions,

and the outer part concerns dimensions. The systematization of Table 1 defines the colors. Adding the wheels of institutional capacity has the practical effect of facilitating the visualization of the changes between the 2013 and 2020 editions of Munic. This same visualization model was applied to the sectoral analysis of institutional capacity, separated into “risk management” and “environment.”

In the Munic “environment” supplement, there was a different trend: an abrupt degradation of results between 2013 and 2017 (Figure 5). If in 2013 all institutional effects were positive, in 2017, they all became negative, except the “Human” dimension (“resources” function). In 2020, there was the opposite movement: the adverse institutional effects in 2017 became positive again, albeit with more discrete values. The exceptions were the “Financial management (budgeting, accounting, fundraising, sustainability)” dimension (“administrative and support” function), the “financial” dimension (“resources” function), and the “Program planning” dimension (the “technical/program” function). This scenario denotes that the “environment” issue has once again become a priority, but the lack of budgetary resources continues to compromise the planning of policies in the area.

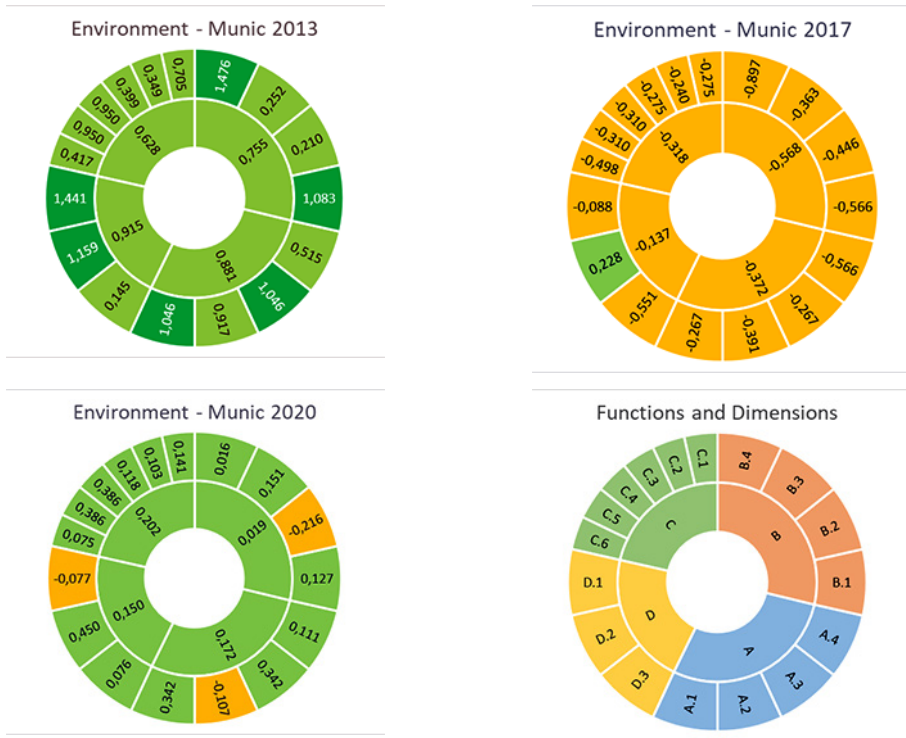
Figure 4 – Institutional capacity wheel for SPMA
Risk management (2013-2020)



Functions	Function Dimensions
A. Administrative and Support	A.1 Administrative procedures and management systems A.2 Financial management (budgeting, accounting, fundraising, sustainability) A.3 Human resource management (staff recruitment, placement, support) A.4 Management of other resources (information, equipment, infrastructure)
B. Technical/Program	B.1 Service delivery system B.2 Program planning B.3 Program monitoring and evaluation B.4 Use and management of technical knowledge and skills
C. Structure and Culture	C.1 Organizational identity and culture C.2 Vision and purpose C.3 Leadership capacity and style C.4 Organizational values C.5 Governance approach C.6 External relations
D. Resources	D.1 Financial D.2 Human D.3 Other

Source: prepared by authors.

Figure 5 – Institutional capacity wheel for SPMA Environment (2013-2020)



Source: prepared by authors.

Synthetized indicators

After these analyses, it is possible to envision synthesized indices weighting the weights of the functions and dimensions for the years 2013, 2017, and 2020 (Table 3). The index synthesized by function was measured by calculating the average between the values obtained by the indicators of each surveyed dimension. The same process was carried out to synthesize the sectoral indicators, with the previous separation of the indicators by

theme. In the summarized data, it is possible to perceive a continuous deterioration of the institutional capacity to face climate change in the SPMA between 2013 and 2020. If, in 2013, the institutions helped, in 2020, the institutions negatively influence the policies, in a closer analysis general.

A specific analysis of the synthetic indicator to risk management theme (Table 4) identifies that institutional capacities are deteriorating in SPMA. In 2013, institutions had a positive effect of 0.756 on the overall

Table 3 – Munic synthesized indicators for institutional capacity (2013-2020)

Functions	2013	2017	2020
Administrative and support	1.006	-0.024	-0.190
Technical/program	0.473	-0.240	-0.334
Structure and culture	0.557	-0.143	-0.264
Resources	0.856	0.050	-0.397
Total	0.725	-0.095	-0.237

Source: elaborated by authors.

Table 4 – Munic synthesized indicators of institutional capacity for risk management (2013-2020)

Risk Management			
Functions	2013	2017	2020
Administrative and support	1.025	0.391	-0.442
Technical/program	0.445	0.107	-0.542
Structure and culture	0.660	0.097	-0.668
Resources	0.907	0.086	-0.627
Total	0.756	0.182	-0.559

Source: elaborated by authors.

Table 5 – Munic synthesized indicators of institutional capacity for the environment (2013-2020)

Environment			
Functions	2013	2017	2020
Administrative and support	0.881	-0.372	0.172
Technical/program	0.755	-0.568	0.019
Structure and culture	0.628	-0.318	0.202
Resources	0.915	-0.137	0.150
Total	0.798	-0.366	0.130

Source: elaborated by authors.

index. In 2017, this positive effect became very discrete, on the order of 0.156. In 2020, the result became negative: -0.559.

The situation of risk management was different from those verified in environmental issues. In 2013, institutional capacities for the environment were very well structured at SPMA. There was a very intense deterioration process, expressed in the 2017 Munic, and a slight recovery of institutional indicators in the 2020 Munic (Table 5).

In 2013, the synthetic indicator of institutional capacity for developing municipal policies related to the environment in the SPMA was positive at 0.798. In 2017, this index became negative: -0.366. In 2020, it was discreetly positive again: 0.130.

Discussion

In a previous analysis, the expansion of the scope of Munic in the years 2013, 2017, and 2020 for a more comprehensive analysis of themes related to the environment and risk management was, in itself, a critical diagnosis, which led to the more significant insertion of this issue on the agenda-setting of public policies, and increases the chances of reinforcing institutional capacity in the medium and long term. From a systemic perspective, in which institutions are defined as a system with inputs and outputs (Brown, Lafonde and Macintyre, 2001), this means a more incredible insertion of themes related to the environment and disaster management in the flows of institutional processes and, later on, their results.

At the federal level, the expansion of the range of issues of the Munic, especially in the area of the environment, as shown in Box 2, indicates that the IBGE was able to reflect, in the 2017 and 2020 Munic editions, on the amplification of the discussion on policies issues related to the environment and disaster risk management, based on the consolidation, in 2015, of legal frameworks related to climate change (Paris Agreement), disaster management (Sendai Framework) and inclusion of both as priorities in SDG 13 – take urgent action to combat climate change and its impacts.

The SPMA municipalities had, in 2013, an institutional framework capable of exerting a positive influence on the construction of public policies, corroborating the argument of authors such as Berman, Quinn, and Paavola (2012) that the tremendous institutional challenge lies in the transformation of coping capacity, usually linked to disaster events, in adaptive capacity, providing perennial institutional change.

The existence of previously built institutional capacity to face climate change in the SPMA municipalities shows the importance of guaranteeing the continuity of these institutional structures. However, the evaluation of the Munic data indicates that there has been a vital degradation movement in the institutional capacities of the municipalities studied. Institutions, which until then had a positive effect, now hurt the construction of policies related to the theme of SDG 13. This change occurs from the 2017 survey onwards. This trend gains strength with the analysis of the Munic 2020 data (see Chart 7). The worsening in the indices between 2013

and 2020 occurred in the four functions related to institutional capacities, and this corroborates the fact that this is a generalized movement, ruling out the chance that it is a punctual or localized fluctuation.

Between 2013 and 2020, institutions at the municipal level, which had positive effects on all dimensions of institutional capacity in the SPMA context, began to negatively affect almost all institutional dimensions (the only exception was “management of other resources -information, equipment, infrastructure”). The synthetic indicators analysis corroborates this scenario in the general and risk management approaches (Tables 3 and 4), presenting substantially different results concerning the theme of the environment (Table 5), which suggests a discrete movement to recover the institutional capacity of these policies.

This scenario shows that the municipal environmental policy standard differs from the risk management standard. While risk management policies are suffering from continuous dismantling, which continues in progress, dismantling institutional capacity in environmental policies was abrupt in the RMSP between 2013 and 2017, with recovery in 2020. With the data from the Munic, it is possible to infer what could be a recovery process of institutional capacity for policies related to the environment in the SPMA, in contrast to the dismantling of institutional capacities aimed at risk management and facing disasters in the region. Still, both perceptions need to be confirmed by further surveys.

Regarding the comparison with other studies, the results contrast with the research by Dos Santos et al. (2021), who used specific indicators to assess the ability to develop environmental policies between the 2013 and 2017 Munic editions. In 2013, the Southeast region of Brazil had 89% of municipalities with an environmental structure; in 2017, this number increased to 90.8%. However, in 2013, 32.9% of the municipalities had an exclusive environmental agency; in 2017, this index dropped to 27.3%. Municipalities with exclusive environmental legislation in the Southeast region were 73% in 2013 and continued to be 73% in 2017 (ibid.). These data show that, in a more general context, public policies related to the environment were in a scenario of stagnation between 2013 and 2017, with occasional setbacks, which differs from the scenario of deterioration of environmental policies verified in the RMSP.

Implementing policies to tackle climate change at the local scale is not a problem either since there are relatively successful examples of implementing policies to tackle climate change at the local level in Portugal. However, these policies are heterogeneous and depend on budget prioritization (Mourato and Ianuzzi, 2021). This type of analysis strengthens the perception that the institutional deterioration in the SPMA between 2013 and 2020 is not a general trend, neither in Brazil nor in the international context. More robust data are needed to confirm this perception concerning tackling climate change in the Brazilian context, particularly in the case of the SPMA.

Conclusions and recommendations

The first conclusion of the article is that, in a more general view, the policies related to building institutional capacity to meet the targets of SDG 13 in the SPMA are undergoing a process of significant deterioration since the first survey studied in 2013. This deterioration movement is generalized since it affects all four functions and all 17 dimensions studied. However, further research is needed to identify whether this is a general trend in the Brazilian case or a phenomenon restricted to the SPMA.

In a more specific analysis, the perception is that the institutional capacity to deal with risk management in the SPMA continues to deteriorate. In contrast, the institutional capacity for environmental policies slightly recovered between the 2017 and 2020 surveys, which may indicate the beginning of a more perennial moment of restructuring institutional capacities about the subject.

It is recommended that the methodology used to analyze institutional capacities be replicated for other Brazilian municipalities since the Munic survey covers all cities in the country. The methodological model developed has this capacity. In addition, it is possible to make new cuts within the survey: to verify how this process of deterioration of institutional capacities took place in the existing sub-regions within the SPMA, as well as in some larger municipalities in the region, such as São Paulo, Guarulhos, São Bernardo do Campo, Santo André, and Osasco. The developed method can support the institutional strengthening of policies to combat climate change in the SPMA.

Finally, it is possible to integrate these indicators with other policies, made possible by the federal government, the state government, metropolitan instances, inter-municipal consortia, and other inter-municipal instances for the measurement, with greater precision, of the institutional capacities for the development of related policies issues related to SDG 13.

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Translation: this article was translated from Portuguese into English by the authors themselves.

Acknowledgment

This study was carried out with the São Paulo Research Foundation (FAPESP) support. Project: “Multidisciplinary research methods on disaster risk research: inputs for building people-centered and multi-hazards early warning systems.” Grant number: 2018/06093-4.

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Received: December 15, 2022

Approved: April 12, 2023