

Adaptive governance: a challenge to Brazilian metropolitan regions

Governança adaptativa: desafio para regiões metropolitanas brasileiras

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Abstract

The purpose of this article is to present a theoretical discussion about the institutional dimension of the concept of adaptive governance. We discuss examples of this institutional dimension based on an analysis of the limits to the implementation of adaptive governance in Brazilian metropolises, based on: 1) the financial resources available to the environmental management of municipalities belonging to metropolitan regions; 2) the creation of an institutional arrangement for climate governance in the municipality of Rio de Janeiro. Despite the incremental aspect, the analyzed data indicate the low fiscal relevance of the environmental issue, as well as difficulties in implementing governance arrangements that succeed in providing transversal planning capacity, mechanisms for the integrated action of different agents, and incentives to an enhanced participatory dynamics in the formulation and implementation of climate policies.

Keywords: institutional adaptive capacity; adaptive governance; climate action plan; fiscal resources; Brazilian metropolitan regions.

Resumo

O objetivo deste artigo é discutir teoricamente a dimensão institucional do conceito de governança adaptativa. Portanto, buscamos explorar essa dimensão a partir da análise dos limites para a implementação de uma governança adaptativa nas metrópoles brasileiras, considerando: 1) os recursos financeiros disponíveis para a gestão ambiental dos municípios pertencentes às Regiões Metropolitanas; e 2) a criação de um arranjo institucional de governança climática no município do Rio de Janeiro. Apesar do aspecto incremental, os dados analisados indicam a baixa relevância fiscal da questão ambiental e as dificuldades de implementação de arranjos de governança que forneçam: capacidade de planejamento transversal, mecanismos para a ação integrada entre diferentes agentes e incentivos para uma profunda dinâmica participativa na formulação e na implementação de políticas climáticas.

Palavras-chave: capacidade adaptativa institucional; governança adaptativa; plano de ação climática; recursos fiscais; regiões metropolitanas brasileiras.



Introduction

In 1985, at the annual conference of the Rhenish-Westfallian Academy of Science, Luhmann (1989, p. XVII) asked the scientists gathered there whether “modern society could adapt itself to the exposure to ecological dangers”. In addition to echoing his affiliation with systemic theory,¹ he was attentive to the institutional challenges to be faced, translated, according to him, in the greater or lesser capacity of the social system and its subsystems to let themselves be irritated by the then-recent communication of the ecological question (*ibid.*, pp. 11-31) (emphasis added). A few years later, not in the key to systemic theory, Pelling (2011, p. 19) warned of the same difficulty when he noted that although climate issues had long been communicated, this communication was almost always structured according to the economic interests involved.²

After 37 years, six Intergovernmental Panels on Climate Change (IPCCs), 27 United Nations Climate Conferences – the last one held in 2022 (COP 27) – and two international agreements – the Kyoto Protocol (1997) and the Paris Agreement (2015), in addition to the Glasgow Climate Pact of 2021 – Luhmann’s question and Pelling’s warning are still current. For, while it is true that the institutional advances undertaken on a global scale cannot be disregarded, even if experts assess their insufficiency for the mitigation of greenhouse gas emissions, we are still faced with the problem of their effectiveness in national and local territories, even though this agenda has intensified in the 21st century (Teixeira and

Pessoa, 2020, p. 217; Di Giulio et al., 2019, p. 1). It is not an easy task, as conflicts, negotiations, and consensus often take place in multiple arenas in an overlapping way, either by the multiplicity of technical and political approaches or by the trans-scale nature of the phenomena.

When the Brazilian experience is assessed, it becomes relevant not only to question the institutional adaptive capacity of local governments to face climate change but, above all, to understand such capacity as a necessary mediation to promote effective articulation with international decisions, confronting the expansion over the territory of the global forms of economic exploitation grounded on a predatory view of the environment.

Based on the debate in the literature, the objective of this article is to problematize initiatives to face climate change through the perspective of adaptive governance. It is divided into three sections, besides the introduction and final considerations: 1) in the first section, the debate in the literature is problematized from the notion of resilience to its configuration in the concept of adaptive governance; 2) in the second, the resources destined to environmental management in Brazilian metropolitan regions are assessed; and 3) in the third, based on the case of the municipality of Rio de Janeiro, we analyzed the building of a climate governance case. In both situations, social participation is considered a reference for analysis since it prevails in the discussion on adaptive governance (Folke et al., 2005, p. 462; Karpouzoglou, Dewulf, and Clark, 2016, p. 5; Di Giulio et al., 2019, p. 1; Andriollo et al., 2021, p. 3) even though no normative pretensions are intended.

Adaptive governance: political-institutional mediation

Adaptation, adaptive capacity, and institutional adaptive capacity are terms that evidence that a discussion hitherto restricted to the field of natural sciences is approaching the field of social sciences (Nelson, Adger, and Brown, 2007). However, if the terms ‘adaptation’ and ‘adaptive capacity’ have been recurrently used, the same cannot be said about the notion of institutional adaptive capacity (Gupta et al., 2010; Chaffin, Gosnell, and Cosens, 2014).

It is possible that this indicates that the institutional question is a recent issue in the literature. In fact, literature has been devoting its efforts more towards the incorporation of the systemic view inherent in the ecological sciences debate, with the goal of producing a social-ecological system (Brown, 2014, p. 109), than to the questioning of how much this same system depends on planned actions of institutional political actors, that is, on state capacity, essential to address the impacts of climate change. The text by Nelson, Adger, and Brown (2007) is an example of the first approach.

According to these authors, the literature on adaptation has been divided into those who understand it as punctual responses to climate change events, acting only in situations of risk and socio-environmental vulnerability, and those who inherit a systemic view from the ‘ecological school’ in which the notion of resilience is the center of the debate. In this case, such a notion is understood not only as the possibility to respond, but also to absorb changes, perceived as opportunities for transforming the whole system and reach

a new adaptive level (ibid., pp. 398-399). In the first case, still, according to the authors, it is a perspective that privileges agency, based, therefore, on negotiated decisions promoted by a network of actors “who struggle to achieve their particular objectives” (ibid., p. 398).³ In the second, the impacts of changes on the whole system are emphasized, considering adaptive capacity “the degree to which the system is susceptible to change while still retaining structure and function; the degree of capacity for self-organization; and the learning capacity” (ibid., p. 399).

Although Nelson, Adger, and Brown (ibid.) propose the convergence of the two perspectives, they tend toward the second approach because, for them, the “actor-based” perspective focuses on “reducing specific vulnerabilities to identified risks”, “therefore they are static in nature; they previously measure risk levels for later adjusting to them.” In contrast, “the resilience approach is concerned with developing sources of resilience to build robustness to uncertainty and maintain the flexibility needed to respond to change. “In the first case, adaptation is the reaction to the situations posed, short-term decisions, therefore, with no room to anticipate surprises. In the second, it is about long-term thinking, incorporating transformations not as inadvertent forces, but as planned, understanding that “change is a fundamental aspect of any system” (ibid., pp. 398-412).

By placing the notion of resilience at the center of the discussion, aiming at a close dialogue with the tradition of ecological thinking, Nelson, Adger, and Brown (ibid.) end up embracing a systemic view that tends to disregard the political impacts of decisions

in the field of adaptive responses. This issue becomes evident when, for example, they question the emphasis that actor-centered perspectives place on the issue of vulnerability. According to them, “reducing vulnerability in one area creates or increases vulnerability in another, which does not imply that it is permissible to ignore vulnerable populations. Instead, it becomes the job of decision makers, including citizens in increasingly participatory processes, to define acceptable levels of vulnerability, who will be considered vulnerable and to what kind of events” (ibid., p. 408).

An institutional dilemma emerges when we take systemic reasoning to its ultimate consequences because its balance, although dynamic, tends to be more emphasized than the attention to the political consequences of the decisions taken. However, the use of the notion of resilience suggests the need to incorporate some institutional dimensions into the debate, aiming to overcome the recurrence of purely reactive actions to environmental urgencies, replacing them with long-term planning to avoid surprises and incorporate the possibility of transformation as inherent to the system itself into the discussion of adaptation. In the words of Pelling (2011), for whom power is at the center of the discussion on adaptation, it is rather a forward-looking adaptation than a backward-looking one, that is, an adaptation exclusively focused on responding to environmental disasters caused by immediate and punctual situations. According to the author, “[it] is here where adaptation has the potential to intervene in development policy and practice through risk reduction” (ibid., p. 22).

Moreover, despite Nelson, Adger, and Brown’s insistence on opposing systemic views and agency, which weakens their arguments, one aspect of their proposition suggests a new meaning to the notion of resilience. According to them, adaptive governance proved most successful when in situations of co-management and decentralization. In their terms: “[...] the strong normative message from resilience research is that shared rights and responsibilities in resource management (often known as co-management) and decentralization are best suited to promote resilience” (Nelson, Adger, and Brown, 2007, p. 409). While they add that it is necessary to “understand how more open and participatory forms of governance deal with issues of future uncertainty and maintain flexibility” (ibid., p. 410), we tend to agree that participatory forms can consolidate more permanently public policies developed in any field, ensuring some continuity even when there are changes of direction in the government agenda.

Given this, we want to suggest that resilience can be understood as an attribute of the institutional adaptive capacity when adaptive policies endure beyond the moments in which they were established or suggested. Besides, there is no indication that they cannot even be modified in the future if spaces of decentralization, participation and co-management are maintained. According to Nelson, Adger, and Brown (ibid.), such spaces can even be understood as “sources of resilience”. We will come back to this point.

Gupta et al. chose the opposite path. More than identifying how the field of social sciences incorporated the conceptual reference

framework of ecological sciences, from a broad review of the literature on adaptation and adaptive capacity, they observed how little the discussions on institutions, governance, and management, long accumulated in social science studies, are absorbed by studies on adaptive capacity. According to the authors, most approaches, when mentioning institutions, tend to use the concept in a “rather vague” way (Gupta et al., 2010, p. 460). In this sense, they suggest thinking about institutional adaptive capacity, as “the conditions under which institutions can stimulate society’s adaptive capacity to deal with the potentially severe and irreversible impacts of environmental change” (ibid., emphasis added).

The importance of the text by Gupta et al. lies beyond the explicitness of the institutional question. It allows us to overcome the dual view of the agency system, introducing the necessary mediation to think institutions beyond state organizations and civil society, as embodied habitus (Wacquant, 2017, p. 214,⁴ highlighting the barriers to its transformation. In this case, they recover for the social sciences the issue of taking the notion of resilience uncritically, because doing so can suggest exactly the opposite of what the notion intends when it was adopted to characterize social-ecological systems. That is, an uncritical and purely systemic notion of resilience may rather emphasize the extent to which established social and cultural action systems absorb change, but subjugate it to previous configurations, thus leading much more to their reproduction than to their necessary transformation.

The authors end up indicating a definition of an institution that points out its conservative aspects, even though it is subject to transformation. In their terms:

[...] institutions are inherently conservative. [...] Therefore, all institutions embody a degree of robustness and resistance to change. The same instance, however, that sustains the reproduction of structures, also enables their transformation. Thus, institutions change and can be changed, but it is difficult to do so. (Gupta et al., 2010, p. 460)

In our understanding, the reproduction may be a relevant aspect of institutions, but we must not give up thinking of it as a political construction, therefore, subject to power disputes, all the time subject to redirection, although always taking into consideration the incorporated dispositions. However, the definition of ‘institution’ that stands out in Gupta et al. (ibid.) is exactly a conservative view because, as it seems, this is how institutions have responded to the urgencies of climate change.

In the long run, Gupta et al. approach the question of “what adaptive capacity means when applied to institutions” (ibid., p. 461). This question is more interesting than the suggested way to answer it, because the authors end up adopting a normative reference,⁵ often found in the literature on resilience since it aims to define indicators for an ideal state of institutional adaptive capacity,⁶ without, on the contrary, observing how the conflicts around responses to climate change are being somehow put or

overcome in the political-institutional arenas, especially from what they have just revealed, the resistance to change of those same institutions.

In this case, the study by Chaffin, Gosnell, and Cosens (2014) seems to contribute more directly to the discussion proposed here, not only because the authors put the issue of governance at the center of the debate – even replacing the notion of adaptive capacity by adaptive governance, thus completing the path initiated by Gupta et al.– but by completely inverting the place from which adaptive governance is interrogated.⁷ Unlike the literature reviewed, for them, it is not about parameterizing a desirable state for a social-ecological system, a rather common approach to the literature focused on the debate on resilience, because, according to them, “who and what sets of values determine the desired state, both ecologically and socially?” (ibid., 2014, p. 5).

For these authors, on the contrary, it is rather a question of asking how adaptive governance is produced. This is no minor inflection, since, differently from the perspective that asks about the ideal state of the resilience of the social-ecological system to absorb changes, what is important is to know how adaptive governance is produced in timely situations in which climate change is faced. In the first case, the emphasis is on the reproduction of the system, even occurring on another level, once the changes are absorbed; in the second, resilience is an attribute of adaptive governance, as something that is achieved as a result of actions produced in the interconnection between social and ecological systems. (emphasis added)

Thus, the authors define adaptive governance as “a range of interactions among actors, networks, organizations, and institutions that arise in the pursuit of a desired state for social-ecological systems” (ibid., p. 6). Or further:

AG [adaptive governance] can arise when actors, networks, and organizations initiate a transformation in search of a new and more desirable state of environmental governance or when they reorganize in response to disturbances, funding opportunities, and/or biophysical shocks to the system, understood as windows of opportunity for policies. (Ibid., p. 9)

This positioning, however, is not to be confused with the option for bottom-up policies as opposed to top-down policies (ibid., p. 1). Nor does it suggest concentrating efforts on empirical studies as opposed to conceptual studies (ibid., p. 7), a very common duality in the literature they analyze. In thinking of adaptive governance as a dynamic social situation, they rather intend to suggest the exact moment of its production as a privileged observation point, as something that is temporally and spatially constructed and that, as a result, can present multiple configurations. Thus, for these forms of adaptive governance to become visible, it is necessary to deconstruct the desirable state as a previously given ideal state. According to the authors, “[...] if we assume that AG arises as the pursuit of a desired state (specific ecological and social outcomes), then deconstructing the context of that desired state can lead to a more complete understanding of AG” (ibid.).

A few consequences unfold from the moment the authors confront an idealized vision of adaptive governance. First, it is important to pay attention to the incremental potentialities of adaptive governance (ibid., p. 9). Although the desirable state is not abandoned as a goal to be achieved, it is defined in relation to the recognition of “signs of an undesirable state of environmental governance” (ibid., p. 8). Second, the multiscale characteristic of adaptive capacity, often propounded as a normative should-be, comes to be identified as a product of the actions of coping with socio-ecological events and can assume multiple scalar configurations. In its terms:

[...] finding a proper adjustment between governance systems and ecosystems is difficult due to the complex nature of biophysical systems, e.g., groundwater and the “built” human-natural environment, impounded watersheds or trans-basin detour, and the myriad of established and transient patterns. (Ibid., p. 6)

Finally, through this new perspective, the very notion of resilience takes on a new meaning. As Nelson et al. (2007) warned, perspectives that privilege pure agency tend to reduce adaptive capacity to punctual and ephemeral responses, according to the urgency of the events confronted. This problem does not go unnoticed by Chaffin, Gosnell, and Cosens (2014). However, according to them, there seems to be no other way to identify the emergence of adaptive governance, considering it in its dynamism, if not through specific local situations (ibid., p. 8), from the participation of various actors mobilized in response to undesirable events (ibid., p. 9).

But it is exactly at this point that the issue of institutionality gains prominence and relevance, because, in this case, it becomes essential to start a movement towards the institutionalization of the changes undertaken, the responses produced, and the practice learned. Without the “social memory” (Folke et al., 2005, p. 453)⁸ of this learning from institutional constructions, future actions will have little effectiveness. It is, therefore, necessary to have in mind

how the adaptive capacity mobilized in earlier stages becomes institutionalized to preserve essential functions for AG, such as monitoring the adjustment between governance, ecological resources, and the desired state [...]. This final phase of the transformation process can also be described as the process of building resilience in governance. (Chaffin, Gosnell, and Cosens, 2014, pp. 8-9; emphasis added)

By building the notion of resilience as an attribute of the institutionalization of the production of adaptive governance, the authors at the same time bring to the foreground the institutional question, a gap in the literature inherited from ecological studies, in the same way that they transform the notion of resilience into a mediating concept. The practices that manage to become institutionalized are those from specific local situations, and precisely for this reason they become so. The reverse is true.⁹ Because legal and institutional frameworks are rooted in specific local situations resulting from the mobilization of actors in response to social-ecological events, adaptive governance tends to be more resilient. Through other means, we find here the source of resilience sought by Nelson, Adger and Brown (2007) exactly because there

is political participation (and not despite it). In the same way, it introduces the possibility of change in institutions perceived by Gupta et al. (2014) as tending to be conservative, given the pressures originating beyond them.¹⁰

According to Andriollo et al. (2021), the notion of adaptive governance, therefore, allows articulating, in the same concept, governance itself, the socio-ecological system and the transformation processes, emphasizing its collaborative aspects as a guarantee of effectiveness, which is a predominant aspect in international (ibid., pp. 1-3; Karpouzoglou, Dewulf and Clark, 2016, p. 5) and national literature (Teixeira and Pessoa, 2020, p. 219).

However, the emphasis on the discussion of resilience, when approached from an institutional perspective, can shade out the transformation processes when they occur. Therefore, one should not forget, when talking about resilience, the incremental changes highlighted by Chaffin et al. (2014), often more significant than those arising from high expectations (Eshuis and Gerrits, 2021, p. 279; Willems and Baumert, 2003, p. 8). In the Brazilian case, for example, ensuring the institutionalization of environmental policies even with precarious effectiveness is essential to the rooting of policies and to the possibility of being maintained or reactivated, even when facing discontinuity between governments. But, once again, the perspective focused on adaptive governance, calling attention to the involvement and engagement of actors that can reactivate what is institutionally dormant, is essential.

In this article, we will emphasize two incremental situations that can be reactivated if considered from the perspective of adaptive governance, with an emphasis on participatory

processes. On one hand, we will analyze how the approval of the “environmental management” item in environmental budgets creates an important gap to promote the budgetary debate necessary for any action to confront climate change. On the other hand, we will demonstrate how legal frameworks are essential to the continuity of institutional practices, even when there are changes in the government’s political orientation. In both cases, we argue that adaptive governance depends on greater social participation, an essential mediation to reactivate those that have already been institutionalized.

Investments in environmental management¹¹

One of the successes pointed out at COP 27 was the approval of resources for the creation of a “loss and damage” fund to finance policies to face the impacts of climate change in vulnerable countries. Although this fund will only be regulated, perhaps, in 2023, its celebration shows how the availability of financial resources to mitigate the effects of climate change is one of the most relevant variables for the constitution of adaptive governance (Gupta et al., 2014, p. 464; Aylett, 2015, p. 5; Sherman et al., 2016; Neder et al., 2021, p. 16).

In the case of Brazil, in 1999, seven years after Eco-92, a federal government ordinance introduced, in the budget law, the item “environmental management”, to aggregate expenses related to environmental preservation and conservation, environmental control, recovery of degraded areas, hydric

resources and meteorology (Brazil, 1999). In this article, we analyze the evolution of this investment for the historical series 2003-2020, available in the National Treasury Secretariat (STN) data, aggregating them to scale of eleven Brazilian Metropolitan Regions (MRs), namely, of Belém: 7 municipalities; of Belo Horizonte: 34 municipalities; of Campina Grande: 18 municipalities; of Fortaleza: 19 municipalities; of Greater Vitória: 7 municipalities; of Maringá: 26 municipalities; of Natal: 14 municipalities; of Porto Alegre: 34 municipalities; of Rio de Janeiro: 20 municipalities; of Salvador: 13 municipalities; of São Paulo: 39 municipalities.¹² We will analyze 1) the total investment in environmental management and its evolution over the historical series; 2) the investment of the MRs and their hub municipalities in relation to the Gross Domestic Product (GDP) - AG/GDP indicator (Fonseca and Souza, 2020, p. 116); 3) the investment in environmental management per capita in the analyzed MRs (Ramos and Rosa, 2018).

Aiming at testing the hypothesis in the international literature highlighting the importance of institutional leadership for adaptive governance (Gupta et al., 2014, p. 460), we separated the analytical periods into two blocks, starting from the mandates of the Brazilian federal government: the period from 2003 to 2015, when several legal frameworks regarding climate policy were approved;¹³ and the period from 2016 to 2020, when the dismantling of public policies within the federal government begins. The second period will also consider the fiscal and economic crises which began in 2015.

Investment in environmental management - MR (2003-2020)

Although the investment in environmental management is not nominally significant, it is important to observe how much it has increased over time. Between 2003 and 2020, a little more than R\$30 billion was invested in this item, an amount distributed among the metropolitan regions as shown in Table 1.

Although a little over R\$20 billion (R\$20,407,743.74) was invested between the years 2003 and 2015, twice as much the investments made between 2016 and 2020 of about R\$10 billion (R\$10,066,756.85). The average investment remained around R\$1.5 billion each year (R\$1,693,027,810.78).

Nonetheless, when we analyze the periods marked by presidential terms, we note significant differences between one period and another. In 2003, when the first term of Luís Inácio Lula da Silva (*Partido do Trabalhador* – PT) began (2003-2006), investments in environmental management in the metropolitan regions analyzed totaled R\$206 million. In 2008, when Marina Silva left the Ministry of the Environment, this figure had already reached R\$1 billion and 600 million, an increase of approximately 600% in relation to 2003. And in 2010, when the PT's second term in office ended (2007-2010), the amount was already a little over R\$2 billion, remaining around this amount throughout Dilma Rousseff's (PT) term in office (2011-2016). In 2017, under Michel Temer (2016-2018), the amount returned to the R\$1 billion and 700 million level, a 17% drop from the previous

Table 1 – Investment in Environmental Management– MR (2003-2020)¹⁴

Metropolitan Regions	Environmental Management (R\$) (x 1000)
MR of São Paulo	10,692,651.54
MR of Belo Horizonte	5,773,149.09
MR of Rio de Janeiro	4,459,328.12
MR of Porto Alegre	3,212,618.02
MR of Fortaleza	2,880,896.16
MR of Great Vitória	1,725,760.82
MR of Salvador	362,756.72
MR of Belém	353,898.25
MR of Campina Grande	343,397.63
MR of Natal	341,232.99
MR of Maringá	328,811.26
Total	30,474,500.59

Source: STN (2003-2020). Own elaboration.

year, possibly due to the economic and fiscal crises that began in 2015. The following year, however, it went up again, remaining at around R\$2 billion per year.

The maintenance of investments at a minimum level evidences the importance of the institutionalization of adaptive governance represented here by the inclusion of the environmental management item in the budget law, thus inducing the allocation of resources to the area, even though no effectiveness is ensured. Another explanatory hypothesis would require the assessment, for the same

period analyzed, of the positions of each of the metropolitan regions in relation to environmental policies, especially for the years 2017-2020. As in the current article we are not able to perform this analysis, we suggest that the non-reversal of the investment to levels lower than those observed may result from pressure exerted locally, at the state or municipal level, introducing the multiscale issue and its contradictions, especially considering the relevance of environmental issues for cities in times of climate change and neo-extractivist economic policies.

Average investment of the MR and its hub municipalities in relation to the GDP

The investment in environmental management, when considering its relationship with the GDP of the MRs, is proportionally small. Nevertheless, when the historical series is observed for all the municipalities belonging to the MRs analyzed here, the investment remained constant throughout the period, despite its significant local oscillations, reinforcing the hypothesis above that territorial determinants can interfere with the allocation of resources for this item. To exemplify, we will analyze the emblematic case of Brumadinho, belonging to the MR of Belo Horizonte.¹⁵

Between the years 2003 and 2009, investments in environmental management in Brumadinho remained, on average, around R\$ 2 million. But in the years 2010-2011,

investments averaged around R\$13 million, a significant increase of 500% over previous years. Even though investments returned to lower levels in 2012, they remained around R\$ 4 million. Therefore, Brumadinho repeats what was analyzed for the MRs as a whole. Even though the municipality lost resources in the area of environmental management, the investments returned to a level higher than the one from which they originated. What may explain the significant increase in resources, especially in 2010-2011, was the election of a mayor belonging to the Green Party.¹⁶

But it was the environmental disaster, in 2019, that caused investments in environmental management to change levels. After the collapse of the iron ore tailings dam in Brumadinho, the investment in environmental management jumped from R\$4,153,700.84 to just over R\$18 million (R\$18,283,781.78). The amount may seem derisory when the tragic

Table 2 - Average Investment Indicator (AI) MR/GDP

MR	Average Investment (AI) (x1000)	GDP (2017) (x1000) – (R\$)	AI/GDP (%)
MR of São Paulo	594,036.20	1,140,000,000.00	0.05
MR of Belo Horizonte	320,730.50	203,908,000.00	0.16
MR of Rio de Janeiro	247,740.45	503,827,000.00	0.05
MR of Porto Alegre	178,478.78	180,402,000.00	0.10
MR of Fortaleza	160,049.79	93,130,000.00	0.17
MR of Greater Vitória	95,875.60	62,467,000.00	0.15
MR of Salvador	20,153.15	118,217,000.00	0.02
MR of Belém	19,661.01	45,041,000.00	0.04
MR of Campina Grande	19,077.65	10,754,000.00	0.18
MR of Natal	18,957.39	34,502,000.00	0.05
MR of Maringá	18,267.29	27,500,000.00	0.07

Source: STN (2003-2020); IBGE. National Accounts: GDP (2017). Own elaboration.

dimensions of the environmental disaster are considered, but its increase of much more than 1000% shows how essential local pressures are for the greater or lesser allocation of resources to the area, regardless, in this case, of governmental guidelines at the federal level. Regrettably, the resources came too late, which reiterates the urgency of reversing this scenario by implementing effective adaptive governance actions rather than mitigating actions.

The AG/GDP indicator for the center cities allows us to observe another aspect for the use of data on investment in environmental management. When this indicator was analyzed nominally for the MRs, we observed that the largest contribution was concentrated in the largest MRs: MR of São Paulo, MR of Belo Horizonte, and MR of Rio de Janeiro (cf. Table 1). But when the same indicator was analyzed for two different periods (2010 and 2019), the comparison highlighted, for example, the significant increase in investment

in the municipality of Vitória. Therefore, when analyzed in isolation, the data even seem derisory, but when compared in different periods, as in the case approached here, it is possible to identify not only the increase in investment (for example, in the MR of Campina Grande) but also its stability (MR of Maringá) or reduction (MR of São Paulo), shedding light on the dispute around budget allocations.

Finally, it should be noted that in 2019, six hub municipalities had a reduction in the AG/GDP indicator or 55% of the municipalities. Only three of them had an increase and two maintained their stability, in this case mirroring the policies at the federal level. However, once again it is worth pointing out that if half of the municipalities are in line with the environmental policies adopted by the federal government in the analyzed period, the others show diverse behavior, especially Vitória, which requires further empirical investigation to evidence the peculiarities of the local dynamics.

Chart 1 – Environmental Management (EM)/GDP Indicator (2010-2019)

Hub Municipalities	EM (2010) / GDP (2010) (%)	EM (2019) / GDP) (%)
São Paulo	0.11	0.04
Belo Horizonte	0.27	0.15
Rio de Janeiro	0.09	0.03
Porto Alegre	0.19	0.01
Fortaleza	0.32	0.10
Vitória	0.36	0.90
Salvador	0.03	0.06
Belém	0.00	0.07
Campina Grande	0.01	0.27
Natal	0.06	0.03
Maringá	0.09	0.09

Source: STN (2003-2020); IBGE-Cities – GDP (2010-2019).

Investment in environmental management per capita (MR)

Per capita investments allow us to identify socio-regional inequality even among metropolitan regions of similar stature, as is the case of the MR of São Paulo, MR of Belo Horizonte, and MR of Rio de Janeiro, more populous and with higher GDP (2017). Among them, however, only the MR of Belo Horizonte assigns a significant per capita value to environmental management which is well above all other MRs. Although the low per capita value for the MR of Rio de Janeiro may come as a surprise, it is important to remember the fiscal crisis that the state of Rio de Janeiro has been going through, which suggests that investments in environmental management tend to be the first to be cut to meet socioeconomic vulnerabilities and/or current expenses.¹⁷

This same dilemma is what may explain the low per capita value in the regions of Belém, Salvador, and Natal, where social inequality is greater. However, we observed an increase per capita in these regions in 2017. The MR of Belém and the MP of Natal are even closer to the MR of Rio de Janeiro, suggesting policies contrary to what had been adopted at the federal level.

Although in 2017 the country was already under the impact of the economic and fiscal crises, only four metropolitan regions showed a drop in the AG/per capita indicator. The others showed an increase in the per capita distribution of investment in environmental management, indicating that there is resilience in the allocation of funds to the sector. However, the values are still very low, which shows that the investment in environmental management has not yet advanced at the same pace as the urgency of climate change.

Chart 2 – Investment in EM/*per capita* – MRs (2010-2012-2017)

Metropolitan Regions	EM / PER CAPITA (R\$)		
	2010	2012	2017
São Paulo	35.94	38.18	25.98
Belo Horizonte	79.09	84.02	64.08
Rio de Janeiro	21.02	25.88	16.65
Porto Alegre	52.76	55.09	53.05
Fortaleza	36.19	38.08	48.63
Vitória	57.71	31.37	38.86
Salvador	4.87	4.11	6.30
Belém	0.34	NI*	15.01
Campina Grande	SI	NI	NI
Natal	7.38	7.42	14,0
Maringá	NI	NI	NI

*NI: No information.

Source: STN (2003-2020); Undp-Brazil, João Pinheiro Foundation and Ipea (2020).

Incorporating the notion of adaptive governance to think about resources for environmental management seems urgent, since, in this case, it would be a matter of ensuring a greater allocation of budget resources to this item through the effective participation of stakeholders. Brazil has a tradition of participatory budgeting practices, and, at this moment, its return is again under discussion at the national level. Thinking about the possibility of including the increment of resources destined to the local rubric of environmental management in the participatory budget agenda seems, therefore, relevant.

The challenge of building climate governance: the case of the Municipality of Rio de Janeiro

Within the scope of adaptive governance, in addition to the necessary resources for its effectiveness, the participatory issue is essential (Folke et al., 2005, p. 462; Karpouzoglou, Dewulf, and Clark, 2016, p. 5; Di Giulio et al., 2019, p. 1; Teixeira and Pessoa, 2020, p. 219; Andriollo et al., 2021, p. 3), as it is not only about “developing the capacity of individuals to learn effectively from their experiences” (Folke et al., 2005, p. 447), but to appropriate the social capital produced (Adger, 2003), aiming at “institutional learning” (Folke et al., 2005, p. 447).¹⁸

In the city of Rio de Janeiro, although no significant ruptures in the planning actions aimed at confronting climate change had been noted, even with a new opposing party in the

City Hall, the participatory issue has not yet gained the necessary effectiveness.¹⁹

On June 4, 2021, the City of Rio de Janeiro published the Rio Decree n. 48,941 which instituted the current climate governance arrangement, comprising the City of Rio de Janeiro Climate Governance Forum (*Fórum de Governança Climática da Cidade do Rio de Janeiro / FCG-Rio*) and the City of Rio de Janeiro Climate Governance Program. One of the goals of this decree was to regulate Article 21 of municipal law n. 5248, of January 27, 2011, which established the Municipal Policy on Climate Change and Sustainable Development, approved at the end of Eduardo Paes’ administration as mayor of Rio de Janeiro (2009-2012).

Despite the change of political groups in the municipal government, it is important to consider the advances made during the Crivella government (2017-2020), which, despite some contradictions in its governmental agenda, continued to give some importance to the climate question. In this sense, we can highlight two decrees related to the theme that had great importance for the design of the current governance arrangement. Rio Decree n. 42,941 of March 15, 2017, followed up on the formulation of the Sustainable Development Plan of the City of Rio de Janeiro, with goals aligned with the Sustainable Development Goals of Agenda 2030; and Rio Decree n. 42,941 of June 11, 2019, which established the Climate Program of the City of Rio de Janeiro as a strategic goal in the Strategic Plan 2017-2020, presented by Crivella in his first year of government. The Climate Program would consist of a Climate Action Plan²⁰ to be completed by 2020; and of a Climate Monitoring System, articulated to the already

existing Municipal Urban Information System. With the onset of the Covid-19 pandemic, the completion of the plan was compromised, leading the city government to enact Rio Decree n. 47,558 of June 29, 2020, which extended the deadlines of the previous decrees by 180 days.

Therefore, Rio Decree n. 48,941 of June 4, 2021, sought to regulate the operation of existing instruments or to implement organizational changes to the climate governance structure announced in Rio Decree n. 42,941 of June 11, 2019, reflecting changes in the municipality's governance structure. In its first article, it established the Climate Governance Forum of the City of Rio de Janeiro (FGC-Rio), regulating the Carioca Forum for Climate Change and Sustainable Development, proposed by law n. 5,248, of January 27, 2011. The FGC-Rio aims to "integrate organized civil society into the city's climate governance structure." However, it defines this body as consultative only, that is, it seems that its capacity to intervene in the process of producing public policies aimed at climate action will be limited, despite its comprehensive and ambitious scope of competencies and attributions:

Art. 2 The Climate Governance Forum of the City of Rio de Janeiro will have the following competencies and attributions:

I – to raise awareness and mobilize society and the government of the City of Rio de Janeiro about the need to promote adaptation and climate risk reduction in the face of the adverse effects of climate change;

II – to gather proposals that promote the mitigation of greenhouse gas emissions, carbon sequestration, and adaptation of the City to climate change and extreme events;

III – to report and give publicity to the implementation of climate actions and the fulfillment of the Climate Action Plan targets;

IV – to contribute to the implementation of the Climate Governance Program in articulation with the National Plan on Climate Change and related public policies;

V – periodically evaluate the goals and implementation strategies of policies, programs, projects, and/or actions that directly or indirectly contribute to reducing greenhouse gas emissions or adapt the city to climate change;

VI – to promote the incorporation of the climate dimension in the decision-making processes of sectorial policies, whose implementation is related to greenhouse gas emission and/or carbon stock factors, giving priority to the use of environmentally adequate technologies;

VII – to present and propose commitments of the City of Rio de Janeiro to national and international organizations in consonance with the objectives of the Paris Agreement;

VIII – to promote interchange between the City of Rio de Janeiro and public and private national and international research entities dedicated to the study and development of solutions for urban resilience to climate change, mitigation of climate risk, and promotion of access to the environment and climate justice. (Rio de Janeiro, 2021)

This decree provides for a balanced composition of the FGC-Rio between representatives of the city government and

civil society, with 10 seats each. However, given its purely consultative nature, and considering that the mayor holds the presidency of the body, we can be suspicious about the ability of civil society's demands to intervene in the city government's agenda. The most likely is that the mayor takes control over the agendas discussed within the forum. In the decree, there is a provision for bimonthly meetings, according to Article 5, but the first meeting of the so-called Management Center of the Climate Governance Program of the City of Rio de Janeiro was only held on September 30, 2021. One of the meeting's agenda items was the approval of a form, prepared by the City's Municipal Secretary of Environment (*Secretaria Municipal de Meio Ambiente da Cidade – SMAC*), that would be sent to the civil society that would be part of FGC-Rio. However, we have no record of this call to date.

The City of Rio de Janeiro's Climate Governance Program Management Center is composed of (1) the Undersecretariat for Planning and Monitoring Results which is now part of the Municipal Finance and Planning Secretariat, previously linked to the Civil House Secretariat; (2) the City's Municipal Environment Secretariat; (3) Instituto Pereira Passos; and (4) the Operations and Resilience Center, therefore changing the name of the Rio Operations Center. The presence of the Undersecretariat for Planning and Monitoring Results in this arrangement, listed even before the SMAC, indicates, from a management point of view, that decisions taken from a political agenda should ultimately be subjected to process control, including quantitative evaluative metrics very common in mitigation policies, but not so evident in adaptation

policies. Given the undersecretariat control in this configuration, the search for a balance should be central.

The Executive Committee on Climate Change, also present in the previous decree, had its attributions significantly modified. In general, one notices the removal of the attributions of exchange and articulation with other agents involved in the theme. Therefore, there is a loss of scope and a change in its nature, from a more political articulation profile to a more technical advisory profile and production of data and reports. The composition of the Committee remains practically the same as the previous decree, reflecting only some administrative situations, such as the dismemberment of departments, such as Infrastructure and Housing; the changes in nomenclature, such as Urban Planning instead of Urbanism and Operations and Resilience Center instead of Rio Operations Center; and the coordination role of the Municipal Secretary of Finance and Planning instead of the Municipal Secretary of the Civil House.

The Climate Governance Program, which replaces the City for Climate Program of the previous decree, is the second initiative in the Rio Decree n. 48,941 of June 4, 2021, and encompasses in the same way: (1) the Climate Action Plan and (2) a Climate Monitoring System. The decree mentions in the sole paragraph of its article 14 that "The Climate Action Plan will contemplate the guidelines and actions contained in the Sustainable Development Plan (SDP) relative to the climate change policy in all dimensions of sustainability" (*ibid.*), maintaining the wording of paragraph 1 of article 3 of Rio Decree n.

42,941 of June 11, 2019. What is indeed strange, then, is that the day after the decree, June 5, 2021, the launching of the Sustainable Development Plan was made, adding climate action to the document's title.²¹ Therefore, it is evident that the Climate Action Plan is fully incorporated into the SDP that was already being developed. It is worth mentioning that the Sustainable Development and Climate Action Plan approved by the municipality of Rio de Janeiro is one of the few examples in Brazil. According to a survey conducted in 2021 in the municipalities comprising 17 metropolitan regions and the Integrated Development Network (*Rede Inegrada de Desenvolvimento – Ride*) of the Federal District, only Rio de Janeiro, Fortaleza, São Paulo, Santos, Curitiba, Salvador, Vitória, João Pessoa, and Recife had a Climate Action Plan. The SDP establishes goals to be achieved in the medium and long term, guided by the Sustainable Development Goals (SDGs) promoted by the United Nations. Added to this, the plan also defines a series of mitigation actions, as well as adaptation and resilience building for the city in relation to the impacts of climate change.

Despite the advances in the implementation of an agenda around the climate issue in the municipality of Rio de Janeiro, which even showed strength in the transition between governments of opposing political groups, we could not identify significant advances toward the creation of a climate governance that would deal with the challenges of the institutional dimension of adaptive capacity. The governance arrangement consolidated from the Decree has not demonstrated an effective capacity for transversal planning, nor even made clear the necessary mechanisms for integrated

action among the different agents involved in the climate agenda. The situation is even more difficult when we consider the absence of participatory dynamics in the formulation and implementation of climate policies from this governance arrangement. Since 2011, the functioning of the Climate Forum has still not been achieved. Therefore, very technocratic conduct on the subject still prevails.

Final considerations

Many studies have already pointed out the challenges to the implementation of adaptive governance in Brazilian cities, among them, the lack of economic resources, the more effective articulation of urban planning with environmental issues, and the low effectiveness of participatory governance (Teixeira and Pessoa, 2020, p. 219; Teixeira et al., 2020, p. 9; and Teixeira et al., 2021, p. 16).

In this article, the goal was less to emphasize the recurrence of these challenges and demonstrate them, than to call attention to the incremental possibility of the policies when they became institutionalized so that they can produce an accumulation of knowledge about the responses and practices undertaken, thus ensuring learning, advancement, and innovation from an institutional point of view. For this, we emphasize the importance of reactivating them through participatory management, which is still not very effective in the two situations analyzed.

We also tried to draw attention to another challenge, essential for the success of adaptive governance: interconnecting different institutional dimensions through comparative studies of local practices. The

literature on adaptive capacity has insisted on the multiscale issue of coping with climate change. In this article, the novelty was not so much to mobilize the discussion about resources for environmental management but to approach it comparatively at the metropolitan scale, a study that still requires further investigation, although the main lines have already been pointed to. It is, therefore, a matter of developing means of analysis that show, in practice, how the multiple scales interpenetrate and even produce new scalar dimensions. In this sense, the social sciences have long insisted on the institutionality of metropolitan management. Much progress was made with the approval of the Metropolis Statute, but there is still much to advance.

With the analysis of the resources destined for environmental management, we tried to demonstrate that the legal framework

established in 1999 was crucial to guarantee longevity in the contribution of resources to the area. In some cases, there was even a significant increase, as in the municipality of Vitória, but they are still reduced given the urgencies. It was important to note, however, that even in situations of economic crisis or contrary governmental orientation, the resources continued to be provided.

Finally, through the case study of the municipality of Rio de Janeiro, we pointed out the relevance of understanding that, as multiscalar as the actions aimed at tackling climate change may be, they can only be effective if rooted in specific local situations, thus requiring, in addition to long-term planning, broad participation of the actors involved, an essential condition for the resilience of adaptive governance.

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Notes

- (1) For the dialogue between Luhmann and Parsons, see Luhmann (2009).
- (2) Evidence identified, for example, in the slide of the notion of ecodevelopment - as the ecological issue was originally named at the 1st United Nations Conference on the Environment, in 1972 - to that of sustainable development (Sachs, 2009, p. 234), now a current terminology.
- (3) All quoted excerpts from international literature have been freely translated by the authors.
- (4) “But it is in the work of Pierre Bourdieu [...] that we find the most complete sociological renewal of the concept outlined to transcend the opposition between objectivism and subjectivism: the habitus is a mediating notion that helps break through the common-sense duality between individual and society by capturing the ‘internalization of exteriority and the externalization of interiority’, that is, the way in which society becomes deposited in people in the form of durable dispositions, or trained capacities and structured propensities to think, feel, and act in particular ways, which then guide them in their creative responses to the constraints and solicitations of their existing social environment” (Wacquant, 2017, p. 214).
- (5) “In this context, this paper seeks to address the question: how can the inherent characteristics of institutions be assessed to stimulate the adaptive capacity of society from the local to the national level?” (Gupta et al., 2010, p. 460; emphasis added).
- (6) According to Brown (2014), a common criticism is that resilience does not consider politics and power relations. Among other things, “by viewing resilience as an end or outcome of action, much literature on SES [social-ecological systems] assumes that there is consensus on the ‘desired state’ or that a desired state exists” (p. 109).
- (7) This inflection promoted by Chaffin, Gosnell, and Cosens explains why it is the most cited reference in later articles. Cf., for example, Andriollo et al. (2021); and Karpouzoglou, Dewulf, and Clark (2016).
- (8) “‘Social memory’ has been defined as the arena in which captured experience with change and successful adaptations, embedded at a deeper level of values, is actualized through community debate and decision-making processes into appropriate strategies for dealing with ongoing change” (Folke et al., 2005, p. 453).
- (9) This approach differs from that which seeks to identify tools that strike a balance between stability and flexibility in adaptive governance (Craig et al., 2017), a view that eliminates movement and conflict between specific situations and their institutional form. In the first case, there is a dual, or even normative, reading of what is stable or what is flexible. In the second, it is a matter of admitting that institutional forms tend toward stability but can be modified through practices that confront them.

- (10) Folke et al. (2005) have already pointed this out: “A social-ecological system with low levels of social memory and social capital is vulnerable to such changes and may, as a consequence, deteriorate into unwanted states. In contrast, crisis can trigger the mobilization of social capital and social memory and can result in new forms of governance systems with the capacity to manage dynamic ecosystems and landscapes. This has been called building social capacity for resilience in social-ecological systems and requires inducing changes in social structures” (p. 455).
- (11) The data analyzed in this section were produced from the Finbra-Siconfi platform of the National Treasury Secretariat giving rise to a database with the investments in environmental management for 231 municipalities belonging to eleven (11) Brazilian Metropolitan Regions. We thank Débora Valim Cirino who assisted us in the database production.
- (12) The metropolitan regions chosen for analysis are part of the project Risk and Environmental Sustainability of Brazilian Metropolises (Risco e Sustentabilidade Ambiental das Metrôpoles Brasileiras 2021-2022 - CNPq/MCT) developed under the scope of the Observatory of the Metropolises, under the coordination of Ana Lúcia Brito and Themis Amorim Aragão. The authors would like to thank all the researchers involved, especially the members of the Institutional Adaptive Capacity Work Group, whose discussions mostly benefited this article.
- (13) Cf. for example: the National Policy for Climate Change (Law No. 12,187/2009), available at: www.planalto.gov.br/ccivi_03/_ato2007-2010/2009/lei/l12187.htm; Decree No. 7,390/ 2010, available at: www.planalto.gov.br/ccivil_03/_Ato2007-2010/2010/Decreto/D7390.htm; the National Plan for Adaptation to Climate Change (Ordinance No. 150/2016), available at: www.mma.gov.br/images/arquivo/80182/Portaria%20PNA%20_150_10052016.pdf; and the New Forest Code (Law No. 12,651/2012), available at: https://www.planalto.gov.br/ccivil_03/_ato2011-2014/2012/lei/l12651.htm.
- (14) All data were updated by the Broad Consumer Price Index (IPCA). Available at <https://www.ibge.gov.br/explica/inflacao.php>. Accessed on Dec 13, 2022.
- (15) As we do not have space to analyze the overall 231 municipalities nor reproduce the database here, we will stick to Brumadinho, a municipality of 41,000 inhabitants (2021), GDP per capita of R\$62,000.00 (2019) and a Human Development Index (HDI) of 0.747 (44th in the ranking of the municipalities of Minas Gerais) (IBGE-Cities). Accessed on May 14, 2023.
- (16) Avimar Barcelos (PV), known as Nenen da Asa, was mayor of Brumadinho in three terms: 2009-2012; 2017-2020; and 2021-2024.
- (17) The dispute over resources between the institutionalization of adaptive governance and the promotion of economic development on the grounds of economic vulnerability is a current in the debate on adaptation, classified by Sherman et al. as Pro-poor Vulnerability Reduction (PPVR). (Sherman et al., 2016, p. 716).
- (18) “A clear and compelling vision, overarching stories and meanings, good social bonds, and trust among stakeholders can mobilize multiple stakeholders at multiple levels and initiate a self-organized process of learning and social capital generation for managing complex adaptive ecosystems” (Folke et al., 2005, p. 448).

- (19) It is important to note that the issue of effectiveness is not always related to the issue of greater or lesser participation of the population directly affected by climate change. Di Giulio et al. pointed out that even when there are advances in the regulatory framework, as is the case in the state of São Paulo, “concrete actions have been limited” (Di Giulio et al., 2019, p. 1).
- (20) The articulation of Rede C40 has strongly supported the elaboration of Climate Action Plans in the cities joining the network.
- (21) On the same occasion, FGC-Rio was launched. Information about both initiatives is available at: <https://fgc-rio-pcrj.hub.arcgis.com/>.

Referências

- ADGER, W. N. (2003). Social capital, collective action, and adaptation to climate change. *Economic Geography*, v. 79, n. 4, pp. 387-404. Clark University, Wiley. Disponível em: <http://www.jstor.org/stable/30032945>. Acesso em: 17 out 2021.
- ANDRIOLLO, E.; CAIMO, A.; SECCO, L.; PISANI, E. (2021). Collaborations in environmental initiatives for an effective “adaptive governance” of social–ecological systems: what existing literature suggests. *Sustainability*, v. 13. Disponível em: <https://doi.org/10.3390/su13158276>. Acesso em: 20 abr 2023.
- ASCEMA – Associação Nacional dos Servidores do Meio Ambiente (2020). *Cronologia de um desastre anunciado: ações do governo Bolsonaro para desmontar as políticas de meio ambiente no Brasil*. Brasília – DF. 2020. Disponível em: https://static.poder360.com.br/2020/09/Dossie_Meio-Ambiente_Governo-Bolsonaro_revisado_02-set-2020-1.pdf. Acesso em: 11 dez 2022.
- AYLETT, A. (2015). Institutionalizing the urban governance of climate change adaptation: results of an international survey. *Urban Climate*. Canadá, v. 14, pp. 4-16.
- BRASIL – Ministério do Planejamento, Desenvolvimento e Gestão (1999). Portaria MOG n. 42, de 14 de abril. Disponível em: http://www.planejamento.gov.br/assuntos/orcamento-1/legislacao/legislacao/portaria-mog-42_1999_atualizada_23jul2012-1.doc/view. Acesso em: 13 dez 2022.
- BROWN, K. (2014). Global environmental change I: a social turn for resilience? *Progress in Human Geography*. Exeter, Reino Unido, University of Exeter, v. 38, n. 1, pp. 107-117.
- CAPELARI, M. G. M. e colab. (2020). Mudança de larga escala na política ambiental: análise da realidade brasileira. *Revista de Administração Pública*, v. 54, pp. 1691-1710.
- CHAFFIN, B. C.; GOSNELL, H.; COSENS, B. A. (2014). A decade of adaptive governance scholarship: synthesis and future directions. *Ecology and Society*. Oregon EUA, Oregon State University, v. 19, n. 3, pp. 1-13.
- CRAIG, R. K.; GARMESTANI, A. S.; ALLEN, C. R.; ARNOLD, C. A.; BIRGÉ, H.; DECARO, D. A.; FRIEMER, A. K.; GOSNELL, H.; SCHLAGER, E. (2017). Balancing stability and flexibility in adaptive governance: an analysis of tools available in U.S. environmental law. *Ecology and Society*, v. 22, n. 2. Disponível em: <https://doi.org/10.5751/ES-08983-220203>. Acesso em: 24 abr 2023.

- DI GIULIO, G. M. ; TORRES, R. R.; VASCONCELLOS, M. da P.; BRAGA, D. R. G. C.; MANCINI, R. M.; LEMOS, M. C. (2019). Extreme events, climate change and adaptation in the state of São Paulo. *Ambiente & Sociedade*, 22. Disponível em: <https://doi.org/10.1590/1809-4422asoc0277r1vu19L4AO>. Acesso em: 20 abr 2023.
- ESHUIS, J.; GERRITS, L. (2021). The limited transformational power of adaptive governance: a study of institutionalization and materialization of adaptive governance. *Public Management Review*, v. 23, n. 2, pp. 276-296. Disponível em: <https://doi.org/10.1080/14719037.2019.1679232>. Acesso em: 20 abr 2023.
- FOLKE, C.; HANH, T.; OLSSON, P.; NORBERG, J. (2005). Adaptive Governance of socioecological systems. *Annual Review of Environment and Resources*, v. 30, n. 1, pp. 441-473. Disponível em: <https://doi.org/10.1146/annurev.energy.30.050504.144511>. Acesso em: 20 abr 2023.
- FONSECA, U. J.; SOUZA, J. F. A. (2020). “A gestão ambiental no orçamento municipal”. In: ALMEIDA, F. A. (org.) *Políticas públicas, educação e diversidade: uma compreensão científica do real*. Guarujá/SP, Editora Científica Digital. Disponível em: <https://www.editoracientifica.com.br/books/livro-politicas-publicas-educacao-e-diversidade-uma-compreensao-cientifica-do-real> Acesso em: 13 dez 2022.
- GUPTA, J.; TERMEER, C.; KLOSTERMANN, J.; MEIJERINK, S.; VAN DEN BRINK, M.; JONG, P.; NOOTEBOOM, S.; BERGSMAN, E. (2010). The Adaptive Capacity Wheel: a method to assess the inherent characteristics of institutions to enable the adaptive capacity of society. *Environmental Science & Policy*, v. 13, pp. 459-471.
- IBGE – Instituto Brasileiro de Geografia e Estatística. *Cidades*. Disponível em: <https://cidades.ibge.gov.br/>. Acesso em: 13 dez 2022.
- IBGE (2017) – Instituto Brasileiro de Geografia e Estatística. *Contas nacionais*. Disponível em: <https://www.ibge.gov.br/estatisticas/economicas/contas-nacionais/9088-produto-interno-bruto-dos-municipios.html?=&t=destaques> Acesso em: 13 dez 2022.
- KARPOUZOGLU, T.; DEWULF, A.; CLARK, J. (2016). Advancing adaptive governance of social-ecological systems through theoretical multiplicity. *Environmental Science & Policy*, v. 57, pp. 1-9.
- LUHMANN, N. (1989). *Ecological communication*. Chicago/EUA, The University Chicago Press.
- _____. (2009). *Introdução à teoria dos sistemas*. Petrópolis/RJ, Vozes.
- NEDER, E. A.; MOREIRA, F. A.; FONTANA, M. D., TORRES, R. R., LAPOLA, D. M., VASCONCELOS, M. P. C.; BREDRAN-MARTINS, A. N. B.; PHILIPPI JR., A.; LEMOS, M. C., DI GIULIO, G. M. (2021). Urban adaptation index: assessing cities readiness to deal with climate change. *Climate Change*. Disponível em: <https://link.springer.com/article/10.1007/s10584-021-03113-0>. Acesso em: 13 dez 2022.
- NELSON, D. R.; ADGER, N. W.; BROWN, K. (2007). Adaptation to Environmental Change: Contributions of a Resilience Framework. *Annual Review of Environment and Resources*. Carolina do Norte/EUA, North Carolina State University, v. 32, n. 1, pp. 395-419.
- PELLING, M. (2011). *Adaptation to climate change. From resilience to transformation*. Londres e Nova York, Routledge, Taylor & Francis Group.
- PNUD-BRASIL; FUNDAÇÃO JOÃO PINHEIRO; IPEA (2020). *Atlas do Desenvolvimento Humano no Brasil*. Disponível em: <http://www.atlasbrasil.org.br/>. Acesso em: 13 dez 2022.

- RAMOS, B. J.; ROSA, F. S. (2018). Estudo sobre gastos com gestão ambiental e desempenho na sustentabilidade dos maiores municípios das mesorregiões catarinenses. In: 16º ENCONTRO CATARINENSE DE ESTUDANTES DE CIÊNCIAS CONTÁBEIS. *Anais*. Florianópolis, Santa Catarina.
- RIO DE JANEIRO (2011). Lei municipal n. 5.248, de 27 de janeiro. Rio de Janeiro, RJ.
- _____ (2017). Decreto Rio n. 42.941, de 15 de março. Rio de Janeiro, RJ.
- _____ (2019). Decreto Rio n. 42.941, de 11 de junho. Rio de Janeiro, RJ.
- _____ (2020). Decreto Rio n. 47.558 de 29 de junho. Rio de Janeiro, RJ.
- _____ (2021). Decreto n. 48.941, de 4 de junho. Rio de Janeiro, RJ.
- SACHS, I. (2009). *A terceira margem: em busca do ecodesenvolvimento*. São Paulo, Companhia das Letras.
- SHERMAN, M.; BERRANG-FORD, L.; LWASA, S.; FORD, J.; NAMANYA, D. B.; LLANOS-CUENTAS, A.; MAILLET, M.; HARPER, S.; IHCC RESEARCH TEAM. (2016). Drawing the line between adaptation and development: a systematic literature review of planned adaptation in developing countries. *WIREs Clim Change*, v. 7, pp. 707-726.
- STN – Secretaria do Tesouro Nacional (2003-2020). *Finbra-Siconfi: dados contábeis dos municípios*. Disponível em: <https://www.tesourotransparente.gov.br/publicacoes/finbra-dados-contabeis-dos-municipios-1989-a-2012/2002/26>. Acesso em: 13 dez 2022.
- TEIXEIRA, R. L. P.; PESSOA, Z. S. (2020). A capacidade adaptativa climática no contexto das cidades brasileiras: um diálogo com as teorias da modernização ecológica e da sociedade de risco. *Brazilian Journal of Policy and Development*, v. 2, n. 3, pp. 205-225. Disponível em: <https://brjpd.com.br/index.php/brjpd/article/view/651112>. Acesso em: 21 abr 2023.
- TEIXEIRA, R. L. P.; PESSOA, Z. S.; ARAÚJO, A. C. B.; DIAS, E. M. S. (2020). Adaptação climática no contexto das cidades brasileiras: reflexões à luz da Agenda 2030 para o Desenvolvimento Sustentável. *PerCursos*. Florianópolis, v. 21, n. 46, pp. 5-24, maio/ago. DOI: 10.5965/1984724621462020005. Disponível em: <http://dx.doi.org/10.5965/1984724621462020005>. Acesso em: 22 abr 2023.
- TEIXEIRA, R. L. P.; PESSOA, Z. S.; DIAS, E. M. S.; ALVES, E. P. Q. (2021). Mudanças climáticas, capacidade adaptativa e sustentabilidade: reflexões a partir das cidades da região semiárida brasileira. *Revista Geotemas*. Pau dos Ferros, v. 11. Disponível em: <https://periodicos.apps.uern.br/index.php/GEOTemas/article/view/3175>. Acesso em: 22 abr 2023.
- WACQUANT, L. (2017). “Habitус”. In: CATTANI, A. M.; NOGUEIRA, M. A.; HEY, A. P.; MEDEIROS, C. C. C. (orgs.). *Vocabulário Bourdieu*. Belo Horizonte, Autêntica Editora.
- WILLEMS, S.; BAUMER, K. (2003). *Institutional capacity and climate actions*. Paris, França, OECD Environment Directorate. Disponível em: OECD and IEA information papers for the Annex I Expert Group on the UNFCCC can be downloaded from: <http://www.oecd.org/env/cc/>. Acesso em: 14 maio 2023.

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