MEASURING SUSTAINABILITY CAPABILITIES OF BRAZILIAN MUNICIPALITIES - THE INSTITUTIONAL CAPACITY FOR SUSTAINABILITY INDEX (ICSI).[1]

Humberto Falcão Martins[2] , Ettore de Carvalho Oriol[3] & Paulo Roberto Guerra[4]

Summary

This paper is part of the Research Project on Institutional Capacities of the Dom Cabral Foundation's Centre for Public Management. It aims to develop a conceptual model on institutional capacities for sustainable development and operationalize it as an Institutional Capacities for Sustainability Index (ICSI). The developed model was used to test the correlation hypothesis between institutional capacities and environmental development in Brazilian municipalities. The method used for statistical validation was Structural Equation Modeling, making it possible to infer that institutional capacity for sustainability is a necessary condition for environmental development but not a sufficient one: only municipalities with high institutional capacity for sustainability achieved good results. In contrast, municipalities with low institutional capacity for sustainability failed to show high environmental development. Part of this finding was a key role played by the business environment in promoting sustainable development - which is consistent with a more pluralistic view regarding institutional capacities. Twelve clusters of municipalities were also identified, clearly showing the existence of three distinct groups: one with higher capacity and more significant development concentrated in the southern and southeastern regions, an intermediate one with medium capacity and medium development, and a group of municipalities with lower capacity and lower development focused in the north and northeast regions. This second finding reinforces the first and shows that achieving a high level of environmental development is only possible with an institutional capacity for sustainability. As a practical contribution, the ICSI can be applied as a diagnosis and indication tool of critical points of attention for targeted actions by public and private agents as part of public policies aiming at fostering sustainable development in multiple sectors or as part of ESG actions by the business sector. This provides a clear and reassuring roadmap for sustainable development initiatives, guiding the audience in their efforts and demonstrating the real-world applications of the research.

Introduction

Generally speaking, the idea of capabilities is related to the mastery of skills, qualities, and resources to achieve an objective, face situations, and implement planned actions (Greeff & Ghoshal, 2004). Thus, capabilities represent probable and stable hypothetical causes of performance (Cartwright, 1998; Chaskin, 2001; Honadle, 1981) - necessary causes but never sufficient, as contextual conditions are also determinant (Pritchett et al., 2013). In any case, the capability-building approach is based on the idea

[1] A version of this paper was accepted for presentation at the 2024 Congress of the Latin American Center for Development Administration- CLAD.

[2] Full Professor at the Dom Cabral Foundation.

[3] Associate Professor at the Dom Cabral Foundation.

[4] Project Manager at the Dom Cabral Foundation's Public Management Center.

that achieving results requires a certain level of capability commensurate with its degree of challenge (Leavitt, 1965).

The debate on institutional capacities is vast but guided by two main perspectives. The first is institutional economics, which highlights the essential role of institutions in promoting development, much more than geographical or market determinants (Rodrik et al., 2004). This includes promoting universal procedures in political and economic institutions to guarantee fairness and respect for laws and contracts (North et al., 2009) and inclusion (Acemoglu & Robinson, 2009).

The second perspective is called the Weberian tradition (Skocpol, 1979), which is centered on the idea of state capacities linked to the Weberian archetype, a model of impersonal rational-legal public organization (Rauch & Evans, 2000), and on the implementation capacity of bureaucratic systems (Dahlström et al., 2010; Pires & Gomide, 2016; Skocpol, 1988).

These perspectives need to explore the sustainability dimension of development - defined as meeting the needs of the present without compromising the ability of future generations to meet their own needs - in a central and detailed way regarding institutional capacities. (Hahn & Figge, 2011) Neither managerial dimensions are focused on formulating, mobilizing, and directing the organizations involved in multiple public policy arrangements. In this sense, this paper seeks to answer the following questions: Does promoting sustainable development require specific institutional capacities, and if so, which ones (which would be more directly and strongly associated with sustainability)? What influence do these capacities have on sustainability in specific cases? The premise is that there is a set of capacities, in varying degrees of specificity, which are centrally related to the dimension of sustainability. Therefore, the hypothesis is that there is a positive correlation between specific institutional capacities and sustainability. These research questions and the hypothesis guide the study's focus and expected outcomes, providing a clear roadmap for the reader.

To this end, an analytical model was developed based on five dimensions that give rise to groups of institutional capacities for sustainability: a) the capacity to thematize, give and make sense of the environmental dimension (Basu & Palazzo, 2008; Bryson et al., 2010; Deslatte & Swann, 2017; Hahn et al., 2014)b) the ability to collaborate, to act in a multi- and multi-institutional manner (Homsy & Warner, 2015; Swann, 2017) oriented towards common goals (Agranoff & McGuire, 2003; Ansell & Gash, 2008; Emerson et al., 2012)c) scalable transformation capacity to deal with significant challenges (George et al., 2016) in large-scale processes (Bryson et al., 2010)d) capacity for institutional resilience, adaptation and transformation in response to environmental shocks and changes (Helfat et al., 2009; Teece et al., 1997; Kattel & Mazzucato, 2018; Salt & Walker, 2006); and e) the capacity of organizational arrangements to establish sustainable directions, monitor and evaluate them, in an adaptive and inductive way (Berman & Wang, 2000; Bingham et al., 2005; Ingraham et al., 2003; Jänicke, 1997; Wang et al., 2014); to acquire and manage resources (Andrews & Boyne, 2010; Hawkins et al., 2016; Ingraham et al., 2003; Krause et al., 2021; Park et al., 2022); and to (re)configure themselves to generate value (Daft & Noe, 1997; Mintzberg et al., 1976; Pfeffer & Salancik, 1978; Wilson, 1989).

The next step was operationalizing the analytical model to test the correlation hypothesis between institutional capacities for sustainability and environmental development. Secondary data was collected from databases such as IBGE, SEEG, the

Central Bank of Brazil, and some repositories of federal government ministries with data from municipalities, among other official repositories, to build indicators of institutional capacities for sustainability. The indicators were aggregated according to the proposed analytical model, and the hypothesis that institutional capacity for sustainability influences environmental development was tested using a causal statistical model with a set of 410 Brazilian municipalities. The result validated the construction of the aggregate index of institutional capacities for sustainability (ICSI). It showed that particular groups of municipalities are highly correlated with the sustainability dimension of development, suggesting that institutional capacity for sustainability is a necessary condition for environmental development.

Conceptual model, hypothesis, and methodology

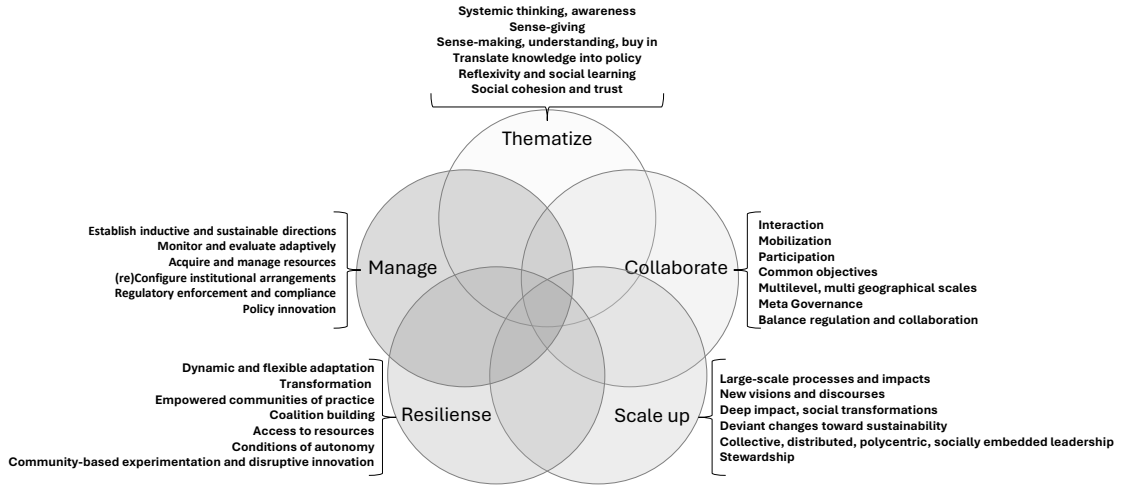
The dimension of sustainability has appeared in various forms in academic and public policy literature. Concepts such as triple sustainability (Elkington, 1997) and ESG (Compact, 2004) emphasize the need to broaden the notion of business results to include ecological and social dimensions. The interdisciplinary field of environmental economics questions infinite economic growth and advocates institutions to respect the planet's ecological limits (Daly, 2015; Ostrom, 2009). The normative and environmental ethics perspective highlights the role of institutions in promoting ethical values regarding the environment (Benson, 2013; James, 1979; Latour, 2018). Transitional approaches emphasize the need to plan a process of transition from unsustainable to sustainable systems, involving large-scale changes in the institutions that govern sectors such as energy, transport, food, etc (Loorbach & Verbong, 2012). Also, documents such as "The Limits to Growth" (Galtung, 1973; Vieille Blanchard, 2010) and "Our Common Future" (Brundtland, 1987) have also served as the basis for multilateral efforts that raise or mirror government positions, such as ECO-92 and the Kyoto Protocol. SDG 17 seeks to "Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development."[5]

The managerial dimension of the organizations and agents involved in public sustainability problems also overlaps and goes beyond the Weberian dimension. Usually, organizational capacity is linked to an organization's ability to manage programs and resources (Andrews & Boyne, 2010; Ingraham et al., 2003; Park et al., 2022). As far as sustainability is concerned, it usually means the presence of the topic in government planning, a specific budget, government agencies with defined competencies, and specialized functional frameworks (Homsy & Warner, 2015; Krause et al., 2016). Indeed, studies suggest a strong association between sustainability and institutional capacities (Betsill & Bulkeley, 2021; Feiock & Bae, 2011; Kahn, 2007; Lubell et al., 2009; Lubell et al., 2009; O'Connell, 2009; Swann & Deslatte, 2019; Wang et al., 2012).

However, conventional approaches are still excessively attached to Weberian visions based on plans, cadres, budgets, and formal duties, leaving insufficiently explored issues related to the broader process of inserting the theme of sustainability into social and managerial practices, collaboration, the scale of interventions, building resilience and the quality of management systems. These five dimensions of capacity overlap and form the essential elements of the model of institutional capacities for sustainability, as illustrated in Figure 1.

[5] Document available at https://sdgs.un.org/topics/capacity-development, accessed on 16/08/2024.

Figure 1: A model of institutional capacities for sustainability.



Source: Prepared by the authors.

The ability to thematize is related to *sense-giving* and *sense-making*, buy-in, and the ability to make *sense* (Wang et al., 2014) of the environmental dimension (Basu & Palazzo, 2008; Bryson et al., 2010; Deslatte & Swann, 2017; Hahn et al., 2014; Spanó et al., 2024); to translate transdisciplinary and transformational scientific knowledge into public policy proposals (Frödin, 2015) to promote reflexivity and social learning (Pahl-Wostl, 2017) and, based on these, to promote social cohesion and trust between actors to facilitate understanding and cooperation (Svendsen & Svendsen, 2004; Arnstein, 1969). This implies the ability to develop systemic awareness among stakeholders about the dynamics of the system, path dependencies, and obstinacies that hinder sustainability based on the creation of a collective vision of radical departure from the trend path, including alternative scenarios based on systems thinking (Sarabia & Peris, 2024).

Collaboration, interaction, and mobilization capacities are related to multi- and multi-institutional action (Homsy & Warner, 2015; Swann, 2017; Lafferty &Hovden, 2003) oriented toward common objectives (Agranoff & McGuire, 2003; Ansell & Gash, 2008; Emerson et al., 2012) multi-level perspective (Bulkeley & Betsill, 2005); and through governmental meta-governance (Bouckaert, 2023). Sarabia and Peris (2024), as part of a model of urban transformative capacities, emphasize the component of inclusive and multiform governance, "diversified, flexible and robust with broad participation and active inclusion of stakeholders from all sectors in a diversity of modes of governance and networks of actors with sustained and effective intermediary organizations and individuals across sectors and domains" (Sarabia & Peris, 2024, p. 4). Collaboration also makes it possible to integrate different levels of action that are usually fragmented, such as organizations, individuals, families, groups, networks, and society in general, across political-administrative levels and geographical scales (Sarabia & Peris, 2024). Beyers et al. (2023) emphasize balancing regulatory action and collaboration. In any case, the possibilities for collaboration depend on different conditions of community capacity, ideological positions, and institutional arrangements for service provision that may be more or less conducive to collaboration (Cho et al., 2023).

Scalar transformative capabilities are needed to deal with grand challenges (George et al., 2016) to generate large-scale processes and impacts (Bryson et al., 2010), to lead social transformations across multiple issues, levels, sectors, organizations, borders, etc., in a collective, distributed, polycentric, socially embedded and shared way (Crosby & Bryson, 2018). It is about the capacity for change to "conceive, prepare, initiate and execute deviant changes towards sustainability within and across multiple complex systems" (Wolfram & Frantzeskaki, 2016, p. 126). In particular, Frantzeskaki (2020) highlights four different types of capacity in the climate governance system: stewardship, unlocking, transformation, and orchestration. Leadership here is critical to boosting the role of varying change agents, especially in transferring cross-sectoral discourses, domains, and scales in articulating the construction of new visions and discourses to leverage collective energies and social learning. (Sarabia & Peris, 2024). Castán Broto et al. (2019) identify a low incidence of transformative approaches in sustainability initiatives and find a strong correlation with social learning and visionary components in government planning.

Institutional resilience is a crucial capacity for sustainability, evoking the ability of institutions to adapt and transform in response to environmental shocks and changes, becoming flexible and adaptive, coping dynamically (Helfat et al., 2009; Teece et al., 1997) with uncertainty and adverse conditions (Kattel & Mazzucato, 2018; Salt & Walker, 2006). This includes empowered communities of practice based on shared experience of common concerns and requires association, coalition building, access to resources, and conditions of autonomy (Sarabia & Peris, 2024). It also includes diverse, community-based experimentation with disruptive innovation, leading to deviant initiatives and incorporating and coupling innovation until its institutionalization in routines, organizations, and legal frameworks. (Sarabia & Peris, 2024). Although cross-cutting in relation to the other groups of capacities addressed, stakeholder involvement is critical in building resilient systems for coping with adverse situations (Conroy & Berke, 2004; Portney, 2005; Portney & Berry, 2010; Sharp et al., 2011).

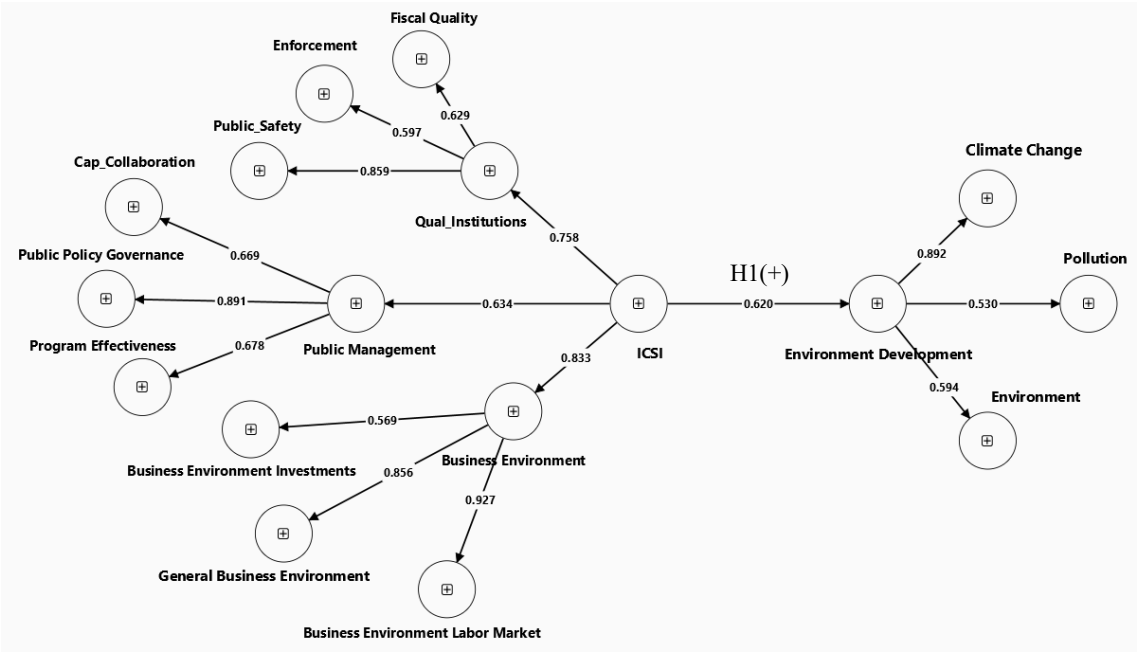
Last but not least, managerial capabilities are centered on organizations (and can refer to a set or subset of them) and have accentuated their ability to establish sustainable directions, monitor and evaluate them adaptively and inductively (Berman & Wang, 2000; Bingham et al., 2005; Ingraham et al., 2003; Jänicke, 1997; Wang et al., 2014) ability to acquire and manage resources (Andrews & Boyne, 2010; Hawkins et al., 2016; Ingraham et al., 2003; Krause et al., 2021; Park et al., 2022); and to (re)configure themselves to generate value (Daft & Noe, 1997; Mintzberg et al., 1976; Pfeffer & Salancik, 1978; Wilson, 1989). Concerning sustainability in particular, Zeemering (2021) mentions the integration of sustainability into government strategic planning, and Liao et al. (2020) and Kim and Li (2017) integrate territorial and resilience plans. Managerial capabilities speak directly to regulatory enforcement and compliance (Porter & van der Linde, 1995; Mazmanian, 2009), environmental planning and management (Campbell, 1996), policy innovation (Ostrom, 2010), resource mobilization, and funding (Bowman, 2011).

There is a strong emphasis on addressing these capacities in various combined ways and at the local level, although this is the least advanced level in capacities (Iqbal et al., 2022). The big challenge is how to measure these five categories of capacities to operationalize the conceptual model and empirically test the hypothesis that the

institutional capacity of Brazilian municipalities positively influences sustainable development.

The proposed model combines the five dimensions above based on existing indicators and the construction of new indicators, all of which originate from public secondary data (IBGE, Ministry of Economy, SEEG, Central Bank of Brazil, among others), forming the basis of the Institutional Capacity Index for Sustainability. In the proposed model, whose structure is illustrated in Figure 2, the five dimensions of institutional capacities mentioned above are distributed between two proposed constructs: Quality of Institutions and Public Management. The Quality of Institutions comprises three sub-components: public safety, enforcement, and fiscal quality. Public Management comprises public policy governance, public policy effectiveness, and people management in public administration. A third construct, the business environment, is also made up of three elements: one more general, one that seeks to deal with investments, and another with the labor market. The indicators that comprise each model's components will be presented later in Table 5.

Figure 2: The tested model.



Source: Prepared by the authors.

The method used to build the conceptual model was synthesis, which required reviewing and integrating the literature (Cooper, 2016; Maxwell, 2012), identifying key variables and constructs (Creswell & Creswell, 2018; Miles et al., 2014), developing hypotheses and propositions (Yin, 2018; Creswell & Poth, 2017), data collection and integration (Tashakkori & Teddlie, 2010; Denzin & Lincoln, 2018), analysis and synthesis (Miles et al., 2014; Braun & Clarke, 2006), model building (Corbin & Strauss, 2015), model testing and validation (Hair et al., 2010) and identifying theoretical and practical implications (Popay et al., 2006).

To test the model, secondary data collected from official Brazilian government websites was used in an attempt to reduce the possibility of bias in the construction of the data, such as the political or ideological influence that exists in some data repositories due to the methodological choices made in the collection process itself.

(Daas & Arends-Tóth, 2012). The base constructed is considered the 410 largest municipality in total population.

The databases used were from the Brazilian official statistical office (IBGE) and other public agencies and databases (RAIS, CNAE, CNPQ, Central Bank, INEP, ANATEL, SEEG, MapBiomas, SNIS, Munic/IBGE, Ministry of Citizenship, and others). The data from these repositories was downloaded, and part of it served as the basis for constructing the indicators used to validate the model and subsequently compose the ICSI.

The external model was validated by applying a confirmatory factor analysis (CFA) (Ringle et al., 2014). The hypothesis test (of the internal model and structural model) was carried out using structural equations (Structural Equation Modeling based on Partial Least Square—SEM-PLS) (Hair et al., 2009). Once the model had been validated, all the indicators were normalized to make them comparable within a range of 0 to 1.

To compose the ICSI, we began by grouping the values of the indicators in each of its constructs, applying the factor loadings found as a weighting factor. For the second and third-order constructs, the factor loadings found in the tests were also used to weigh the sum of the indicators.

The final result was clustered to check how the groups were organized to identify homogeneous and heterogeneous characteristics (Dalmaijer et al., 2022; Ullmann et al., 2022). Excel, SPSS, and SmartPLS 4 software were used to construct all these tests.

Results

The presentation of the results begins with validating the external model through confirmatory factor analysis - CFA (Hair et al., 2009; Ringle et al., 2014). After excluding some of the indicators initially considered, the Convergent Validity is verified, as shown in Table 1. Table 2 shows the Discriminant Validity according to the method of Fornell and Larcker (1981) and the Composite Reliability and Average Variance Extracted (AVE) (Valentini & Damásio, 2016). The result shows that concerning Composite Reliability, considering the cut-off point of 0.700 as usually applied, three constructs were found to have lower values. However, considering 0.600 as the cut-off point, as Hair et al. (2009) indicated, all the constructs qualify with higher values. For the Average Variance Extracted - AVE, only the Pollution construct did not reach the cut-off point shown in the literature 0.500 (Valentini & Damásio, 2016). However, the value was 0.469, which is very close to 0.500.

For the Discriminant Validity test of the second and third-order constructs, all showed validity according to the criteria of Fornell and Larcker (1981). The Composite Reliability showed values above 0.700 for all constructs, and the Average Variance Extracted - AVE did not show a value above 0.500 for Environmental Development. However, it was still very close to the threshold recommended by the literature. (Bido et al., 2017; Hair et al., 2009; Ringle et al., 2014).

Table 1: Convergent validity of the indicators in their first-order constructs.

Convergent validity

	Estimate	Average	Desv Standard	t-statistics	p-value
Cap_Colab_TG_03 <- Cap_Collaboration	1.000	1.000	0.000	n/a	n/a
Dev_Env_Clim_Chg_01_-1 <- Climate Change	0.613	0.618	0.062	9.886	0.000
Dev_Env_Clim_Chg_02_-1 <- Climate Change	0.897	0.896	0.022	41.078	0.000
Dev_Env_Clim_Chg_03_-1 <- Climate Change	0.782	0.768	0.072	10.787	0.000
Dev_Envir_Envir_01 <- Environment	1.000	1.000	0.000	n/a	n/a
Dev_Envir_Poll_01_-1 <- Pollution	0.651	0.617	0.153	4.25	0.000
Dev_Envir_Poll_02_-1 <- Pollution	0.754	0.747	0.175	4.303	0.000
Div_Cons_Finalist <- Public Policy Governance	0.698	0.696	0.037	18.84	0.000

EA_Cons_Finalistico <- Public Policy Governance	0.859	0.859	0.014	61.605	0.000
Effectiveness_Activ_Finalist <- Effectiveness of Programs	1.000	1.000	0.000	n/a	n/a
Infr_Cons_Finalist <- Public Policy Governance	0.788	0.787	0.024	32.26	0.000
Inst_Enforc_01_-1 <- Enforcement	0.851	0.852	0.038	22.592	0.000
Inst_Enforc_02_-1 <- Enforcement	0.730	0.721	0.072	10.117	0.000
Inst_Pub_Sec_01_-1 <- Seg_Publica	0.982	0.982	0.002	530.952	0.000
Inst_Pub_Sec_03_-1 <- Seg_Publica	0.981	0.981	0.002	467.338	0.000
Mg_Bus_Env_03 <- Business Environment Labor Market	0.761	0.765	0.024	31.418	0.000
Mg_Bus_Env_05 <- Business Environment Investments	0.804	0.763	0.094	8.587	0.000
Mg_Bus_Env_06 <- General Business Environment	0.811	0.816	0.025	31.826	0.000
Mg_Bus_Env_07 <- Business Environment Investments	0.637	0.704	0.132	4.834	0.000
Mg_Bus_Env_08 <- General Business Environment	0.841	0.837	0.016	54.111	0.000
Mg_Bus_Env_09 <- Business Environment Labor Market	0.895	0.894	0.011	79.553	0.000
Mg_Bus_Env_11 <- Business Environment Labor Market	0.678	0.671	0.057	11.796	0.000

Source: Prepared by the authors.

Table 2: Discriminant Validity of the first order Constructs.

Discriminant Validity - 1st-order constructs

		6	7	8	9	10	11	12	13	14	15	16	17	
6	Environment	1.000												
7	Climate Change	0.277	0.773											
8	Pollution	0.183	0.254	0.704										
9	Public_Safety	0.156	0.280	0.180	0.870									
10	Enforcement	0.093	0.272	0.147	0.337	0.793								
11	Tax Quality	0.400	0.275	0.173	0.344	0.088	0.713							
12	Cap_Collaboration	0.168	0.143	0.108	0.148	0.081	0.317	1.000						
13	Public Policy Governance	0.238	0.147	0.127	0.142	0.004	0.358	0.377	0.784					
14	Program Effectiveness	0.126	-0.007	0.060	-0.050	-0.083	0.197	0.374	0.413	1.000				
15	Business Environment Labor Market	0.260	0.135	0.113	0.225	0.071	0.567	0.208	0.265	0.244	0.783			
16	General Business Environment	0.423	0.315	0.243	0.304	0.198	0.596	0.290	0.294	0.187	0.666	0.826		
17	Business Environment Investments	0.100	0.088	0.034	0.107	-0.003	0.277	0.228	0.246	0.148	0.411	0.298	0.725	
Composite Reliability		1.000	0.813	0.662	0.902	0.771	0.606	1.000	0.826	1.000	0.824	0.812	0.686	> 0.70
VME		1.000	0.597	0.496	0.758	0.628	0.508	1.000	0.615	1.000	0.613	0.683	0.526	> 0.50

Note: The value shown on the diagonal is the result of the Square Root of the Average Variance Extracted - AVE as indicated by Fornell and Larcker 1982

Source: Prepared by the authors.

Table 3: Discriminant Validity of the Second and Third order Constructs.

Discriminant Validity 3rd order

		1	2	3	4	5	
1	Environmental Development	0.691					
2	ICSI	0.643	0.753				
Discriminant Validity 2nd order							
3	Qual_Institutions	0.472	0.774	0.709			
4	Public Management	0.238	0.641	0.297	0.753		
5	Business Environment	0.334	0.831	0.507	0.412	0.798	
Composite Reliability		0.722	0.795	0.750	0.794	0.835	> 0.70
Average Variance Extracted - AVE		0.477	0.567	0.502	0.567	0.636	> 0.50

Note: The value shown on the diagonal is the result of the Square Root of the Average Variance Extracted as indicated by Fornell and Larcker 1982

Source: Prepared by the authors.

The test of hypothesis H1(+) showed a statistically valid result to refute the null hypothesis and accept the alternative hypothesis. According to the literature (Hair et al., 2009), the p-value was less than 5%. As the Beta found was 0.643, the ICSI explains 0.412 or 41.20% of the variance observed in Environmental Development. This value indicates a strong influence, according to Cohen (1988).

Table 4: Hypothesis test.

Testing the Hypothesis

	Estimate	Average	Desv Standard	t-statistics	p-value	Adjusted R^2	Hypothesis
ICSI -> Environmental Development	0.643	0.639	0.036	17.819	0.000	0.412	Supported

Source: Prepared by the authors.

Table 5 shows the indicators that made up the final model for the ICSI and the Environmental Development construct.

Table 5: Indicators comprising the ICSI and the Environmental Development construct.

	INDICATOR	Polarity
ENVIRONMENTAL DEVELOPMENT		
Climate Change		
Dev_Env_Clim_Chg_01	Natural forest cover	Positive
Dev_Env_Clim_Chg_02	Illegal deforestation	Negative
Dev_Env_Clim_Chg_03	Speed of illegal deforestation	Negative
Environment		
Dev_Envir_Envir_01	Domestic waste collection coverage	Positive
Pollution		
Dev_Envir_Poll_01	Waste disposal	Negative
Dev_Envir_Poll_02	Greenhouse gas emissions	Negative
ICSI		
Quality of institutions		
Public Safety		
Inst_Pub_Sec_01	Intentional violent deaths	Negative
Inst_Pub_Sec_03	Mortality of young people for safety reasons	Negative
Dev_Soc_10	Mortality from preventable causes	Negative
Application of Laws and Rules		
Inst_Enforc_01	Transport fatalities	Negative
Inst_Enforc_02	Transport morbidity	Negative
Tax Quality		
Inst_Fisc_Qual_01	Tax dependency	Negative
Inst_Fisc_Qual_02	Indebtedness	Negative
Public Management		
Capacity for collaboration		
Cap_Colab_TG_03	Municipalities' ability to collaborate	Positive
Public Policy Governance		
Div_Cons_Finalist	Diversity of participation in public policy councils	Positive
EA_Cons_Finalistico	Administrative Structure of Public Policy Councils	Positive
Program Effectiveness		
Effectiveness_Activ_Finalist	Proxy for Public Policy Enforcement Effectiveness	Positive
Business Environment		
General Business Environment		
Mg_Bus_Env_06	Jobs in the creative sector	Positive
Mg_Bus_Env_08	Economic complexity	Positive
Business Environment Investments		
Mg_Bus_Env_05	Resources for research and scientific development	Positive
Mg_Bus_Env_07	Credit per capita	Positive
Business Environment Labor Market		
Mg_Bus_Env_03	Formality in the labor market	Positive
Mg_Bus_Env_09	Average income from formal work	Positive
Mg_Bus_Env_11	Qualification of workers in formal employment	Positive

Source: Prepared by the authors.

Once the model had been validated and the hypothesis tested, the indicators were constructed and finally aggregated into the ICSI format. The first stage consisted of normalizing all the indicators that comprise the Index. To do this, a zero was created on all the scales by subtracting the lowest existing value from the other values. Then, to leave the scale in a range from 0 to 1, all the values in the indicator were divided by the highest value in the scale, transforming this highest value into one and the rest of the scale into values proportional to the originals, using this highest value as a reference.

After this normalization, a weighted sum was made of the factor loadings identified in the model test of the indicators, generating a corresponding value for each first-order construct in the model. The values found for each construct were normalized again. A second step was carried out by adding up the normalized values of the first-order constructs, weighted by the factor loadings, and arriving at the corresponding values for the second-order constructs. These values were also normalized again. Finally, a new round of weighted summation was carried out, resulting in the ICSI scores.

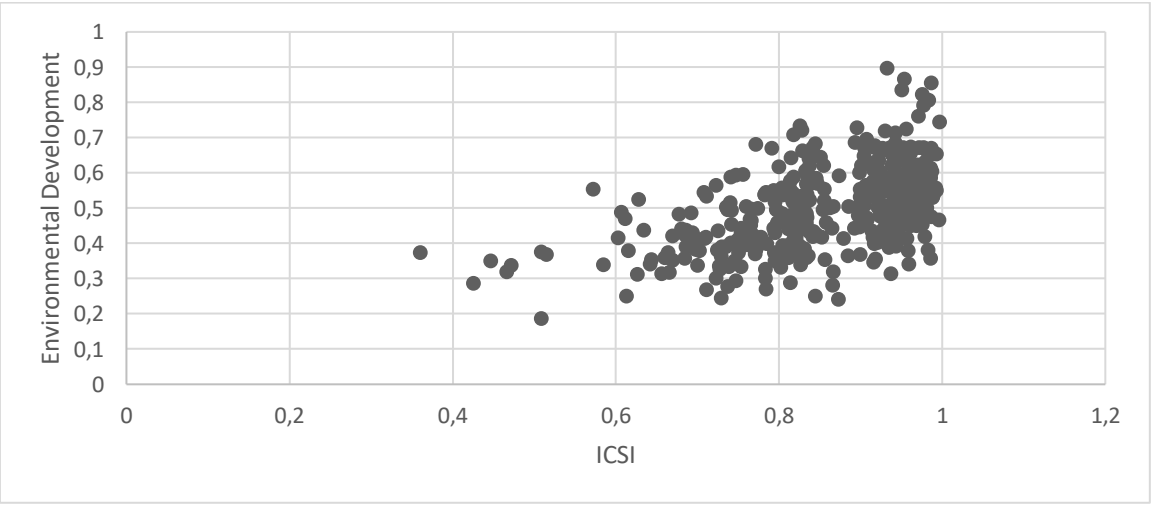
The final results of both the ICSI and Environmental Development were not normalized, thus reducing the possibility of false independence between the constructs caused by their final normalization. The following section will analyze the results, demonstrating their validity and general and specific implications for municipalities' capacity to generate development with environmental sustainability.

Findings and discussion

A first analysis compares the municipal ICSI results with the municipalities' levels of environmental development. As shown in Graph 1, institutional capacity for sustainability is a necessary but not sufficient condition for environmental development. Only municipalities with high institutional capacity for sustainability had good results. On the other hand, municipalities with low institutional capacity for sustainability could not achieve high environmental development.

This first general finding is essential, as it points out that more than merely directing efforts toward developing institutional capacities for sustainability is needed to achieve good environmental results. However, not developing institutional capacities limits any other attempt. As a result, it can be inferred that institutional capacity is how the different efforts achieve their objectives; without it, any other effort will be lost since it is a limiting factor in environmental development. This finding corroborates others regarding the correlation between local capacities and environmental protection (Betsill & Bulkeley, 2021; Feiock & Bae, 2011; Kahn, 2007; Lubell et al., 2009; Lubell et al., 2009; O'Connell, 2009; Swann & Deslatte, 2019; Wang et al., 2012), in particular related to regulatory enforcement and compliance (Mazmanian, 2009), environmental planning and management (Campbell, 1996), community engagement and participation (Arnstein, 1969), resource mobilization and funding (Bowman, 2011), policy innovation (Ostrom, 2010) and Collaboration (Lafferty &Hovden, 2003).

Graph 1: ICSI x Environmental Development.



Source: Prepared by the authors.

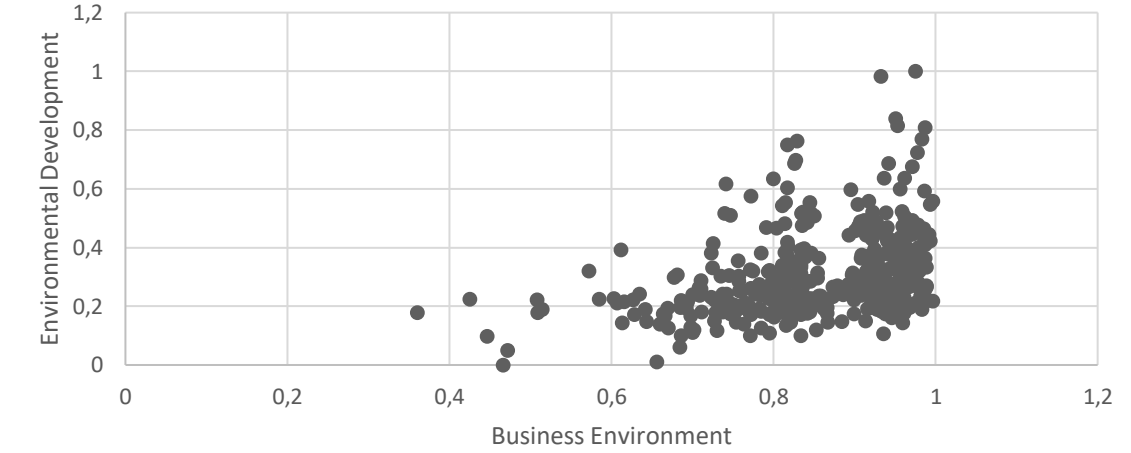
The second general finding regards the contribution of different components of the ICSI on environmental development. It highlights the main weight on Business Environment (0.833), followed by Quality of Institutions (0.758) and Public Management (0.634). Although all three components are interdependent and rank high, the salience of the Business Environment suggests that institutional capacities from the private sector

play a crucial role in environmental development. Hence, approaches focused on state capacities alone reveal analytical limitations.

The comparison of the Business Environment with Environmental Development (Graph 2) shows this exciting result, as it is clear that the necessary but insufficient condition has the most significant impact. The graph shows an obvious upward ceiling line. This line indicates that without a good Business Environment, Environmental Development is not possible. Workers' qualifications, income, and formality are central to these results, followed by economic complexity, credit, and innovation resources, all proxies for sound business practices.

Indeed, the literature suggests some requisites for an environmentally conducive business environment, such as regulatory compliance (Porter & van der Linde, 1995), good corporate social responsibility practices (Carroll, 1999), satisfactory levels of consumer awareness (Ottman et al., 2006) and incentives in terms of innovation and appropriate technology (Rennings, 2000). These requirements, directly and indirectly, relate to the Quality of Institutions and Public Management.

Graph 2: Business Environment x Environmental Development.

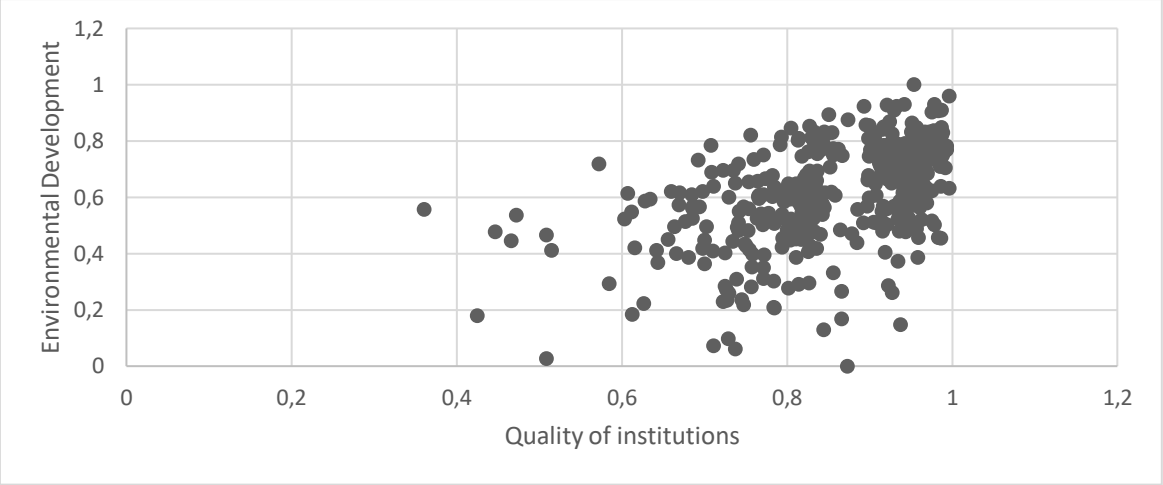


Source: Prepared by the authors.

Cross-referencing the results of the Quality of Institutions with Environmental Development (Graph 3) shows that Environmental Development also functions as a necessary, but not sufficient, condition. However, its limitation is somewhat less, given that a reasonable level of Development is still achieved even at lower levels. In this order, public safety, enforcement, and fiscal quality are the factors at play.

Regarding public safety, the literature explores issues related to environmental conflict (Dixon, 1994) and crime (Neelemann et al., 2014), migration (Reuveny, 2007), and law enforcement (Cutter et al., 2003). In Brazilian municipalities, public security's pivotal role in promoting environmental development may be strongly associated with urban disorder (Maricato, 2001), crime (Barros & Ribeiro, 2009), and environmental crimes (Gonçalves, 2013). Although enforcement appears in the model as a proxy, the literature points out coordination and resource issues affecting regulatory bodies weaken environmental enforcement (Silva, 2020; Lima, 2016). Last, fiscal quality, in turn, is associated with resource availability and fiscal incentives (Seroa da Motta, 2002; Afonso & Araújo, 2019).

Graph 3: Quality of Institutions x Environmental Development.

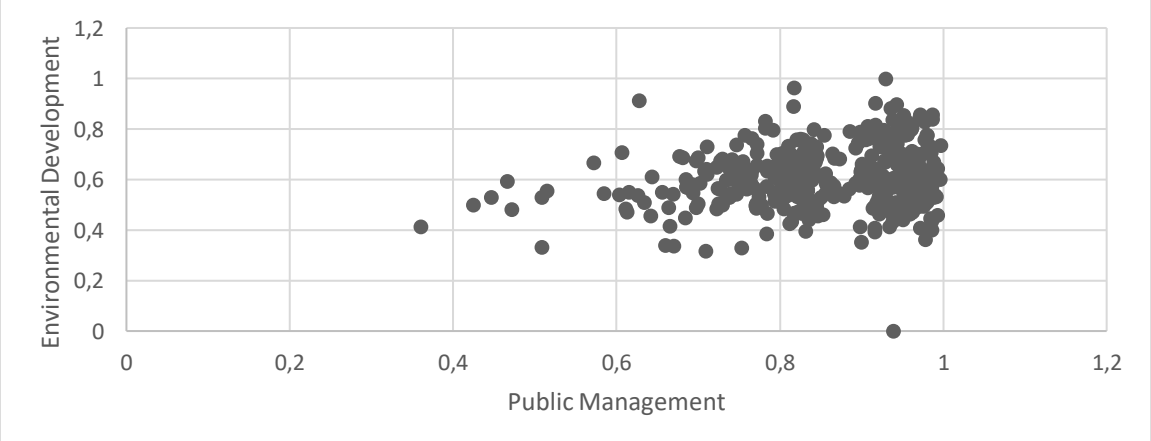


Source: Prepared by the authors.

Finally, crossing Public Management with Environmental Development (Graph 4) shows the same restrictive result as the previous comparison - a necessary but insufficient condition. In this case, greater Environmental Development is possible with a lower level of Municipal Management Capacity. However, as in the previous comparisons, low installed capacity in Municipal Management restricts good environmental performance. The factors associated with environmental development are public policy governance, program effectiveness, and collaboration. These factors are centrally related to managerial competencies insofar as they involve strategic orientation and control (Berman & Wang, 2000; Bingham et al., 2005; Ingraham et al., 2003; Jänicke, 1997; Wang et al., 2014), resource management (Andrews & Boyne, 2010; Hawkins et al., 2016; Ingraham et al., 2003; Krause et al., 2021; Park et al., 2022), and institutional arrangements devoted to managing environmental programs and policies (Daft & Noe, 1997; Mintzberg et al., 1976; Pfeffer & Salancik, 1978; Wilson, 1989). Nonetheless, collaboration and participation are one of the cornerstone capabilities at stake (Homsy & Warner, 2015; Swann, 2017; Sarabia & Peris, 2024; Cho et al., 2023).

Indeed, governance instruments and devices such as rules and regulations, public planning, participatory decision-making and hearings, and economic incentives play a vital role in environmental protection in Brazilian municipalities (Azevedo, 2016; Silva, 2018; Cruz & Oliveira, 2019; Mendonça & Cardoso, 2020; Gonçalves, 2017).

Graph 4: Public Management x Environmental Development.



Source: Prepared by the authors.

A second level of analysis was carried out by clustering municipalities. The clustering was done using SPSS software through Hierarchical Cluster Analysis (Dalmaijer et al., 2022; Ullmann et al., 2022). A first free test was carried out, and the analysis showed that the best choice of clusterization would be 12 different clusters since more significant numbers were generating unitary groups of municipalities, which was not adequate for comparing the averages of these groups.

As shown in Table 6, the groups had a maximum of 96 municipalities and a minimum of 3 municipalities. The information used as a basis for clustering was the state to which they belonged, whether it was a capital city, the region of the country to which they belonged, whether it was a metropolitan region, the primary productive sector, population range, and the Environmental Development and ICIS scores.

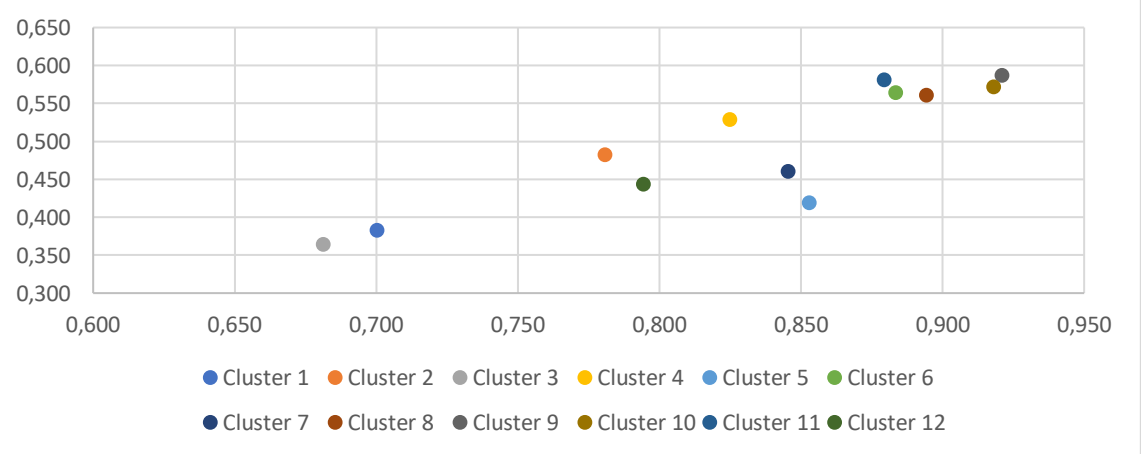
Table 6: ICSI and Environmental Development scores by group of municipalities.

Clusters	Number of Munic.	Average Environmental Development	Average ICSI	Level Found	Number of Munic.	Cluster Regions
1	26	0.700	0.383	Low	51	North (RO/AC/AM/PA/TO)
3	25	0.681	0.365	Low		Northeast (MA/PI/CE/RN)
2	12	0.781	0.483	Middle		North (RO/AC/AM/RR/PA- Only capitals plus some municipalities in PA)
4	3	0.825	0.528	Middle		Northeast (MA/PI/CE - Capitals only)
5	33	0.853	0.419	Middle	168	Northeast (CE/RN/PB/PE/AL)
7	93	0.845	0.460	Middle		Northeast (SE/BA) / Southeast (MG)
12	27	0.794	0.443	Middle		Midwest (MT/MS/GO)
6	4	0.883	0.564	High		Northeast (PE/AL/SE/BA- Capitals only)
8	20	0.894	0.561	High		Southeast (MG/ES/RJ)
9	96	0.921	0.587	High	191	Southeast (SP)
10	67	0.918	0.572	High		South (PR/SC/RS)
11	4	0.879	0.581	High		Midwest (MT/MS/GO)

Source: Prepared by the authors.

The clustering results show specific groups and a strong relationship between Institutional Capacity for Sustainability and Environmental Development. A graphical analysis of the data (Graph 5) shows a linear distribution with an R^2 of 0.763.

Graph 5: Cluster average for ICSI x Environmental Development



Source: Prepared by the authors

The cluster analysis shows that there are very distinct patterns between the groups, with groups 1 (26 municipalities) and 3 (25 municipalities) having lower Capacity and lower Development, in contrast to groups 6 (4 municipalities), 8 (20 municipalities), 9 (96 municipalities), 10 (67 municipalities) and 11 (4 municipalities) which have higher Capacity and higher Development. There are also some groups with average Capacity and Development: groups 2 (12 municipalities), 4 (3 municipalities), 5 (33 municipalities), 7 (93 municipalities) and 12 (27 municipalities). When adding up the number of municipalities by the level observed, 51 municipalities will have a low level,

168 a medium level, and 191 a high level. This result shows that there are more municipalities with a higher level of Institutional Capacity for Sustainability and High Environmental Development than municipalities with low Institutional Capacity for Sustainability and Low Environmental Development.

A regional perspective allows us to infer that the municipalities with the highest environmental development and institutional capacity are located in the southern and southeastern regions. This is also consistent with their size regarding economic dimension and tax revenue. On the other hand, the municipalities in the northern and northeastern regions, except for the capitals, have low and medium levels of institutional capacity.

As an extreme example, the city of Florianopolis stands in a very different situation than Balsa. With an ICSI of 0.897 and an Environmental Development of 0.932, Florianopolis stands out as one with the highest level of Environmental Development. For this, the municipality is both a benchmark in the Environment and the Business Environment - the Labour Market with a score of 1 after normalization, indicating that it is a benchmark in these two indicators. Florianopolis has excellent values in the other aggregate indicators, such as Quality of Institutions with 0.924 and Business Environment with 0.981. The aggregate Municipal Management indicator with 0.755 is the most fragile for the municipality, being close to the lower limit of the first quartile, with several municipalities having higher scores. These figures reflect various municipal and state initiatives on the environmental development of Florianopolis, such as the new master plan (municipality), which seeks to densify some areas with the construction of buildings so that other areas of ecological conservation are maintained, reducing the pressure of population growth and urbanization on these areas, or the mangrove recovery program which deals with both the recovery of the environment and the education of the surrounding population, acting to mitigate climate change.

On the other hand, a negative example is the municipality of Balsa-AM, where the low ISCI severely limits Environmental Development. With an ISCI of 0.287 and an Environmental Development index of 0.425, Balsa-AM is the municipality with one of the worst combinations of ISCI and Environmental Development. The first is that the municipality scored 0 regarding climate change after normalizing the data, indicating that this indicator is the worst situation. The second point is the deficient quality of institutions, with a score of 0.180, ranking it the eighth worst out of 410 municipalities analyzed. The Business Environment is also a negative highlight, with a score of 0.223, below the fourth quartile. All these reflect the movements of degradation and deforestation that have taken place in recent years in the Legal Amazon, translating into numbers the strong relationship between the problems faced in the Amazon concerning forest degradation and the ISCI and, in particular, the Quality of Institutions and the option of different businesses for the region.

Conclusions

This work set out to develop a conceptual model on institutional capacities for promoting environmental sustainability and to operationalize it in the form of an Institutional Capacities for Sustainability Index, the ICSI. This undertaking proved content valid in line with current literature and filled the identified gaps. It also proved

statistically valid and generated a helpful metric for analyzing the correlation between institutional capacities and environmental development.

The model and its application corroborate the hypothesis that institutional capacities for sustainability matter, constituting a necessary condition for the achievement of environmental development, although not sufficient, given that other elements, mainly contextual, can prevent the achievement of the desired development (Cho et al., 2023; Crosby & Bryson, 2018; Deslatte & Swann, 2017). Part of this finding was a key role played by the business environment in promoting sustainable development - which is consistent with a more pluralistic view regarding institutional capacities instead of state capacities approaches. In addition to the more direct answer to the research question, another result was the identification of 12 clusters of municipalities that clearly showed the existence of three distinct groups: one with higher capacity and more significant development concentrated in the southern and southeastern regions, an intermediate one with medium capacity and medium development, and a group of municipalities with lower capacity and lower development concentrated in the north and northeast regions. This second finding reinforces the first and shows that achieving a high level of environmental development is impossible without the institutional capacity for sustainability as suggested in the literature (Betsill & Bulkeley, 2021; Feiock & Bae, 2011; Kahn, 2007; Lubell et al., 2009; Lubell et al., 2009; O'Connell, 2009; Swann & Deslatte, 2019; Wang et al., 2012).

As a practical contribution, the research developed the municipal ICSI, which can be applied as a diagnosis and indication tool of critical points of attention for targeted actions by public and private agents as part of public policies in multiple sectors or as part of ESG actions by the business sector. This point is critical in Brazil as municipalities are the federal entity with the lowest degree of institutional quality and instances in which environmental issues are the subject of polarized or captured treatment. This state of affairs jeopardizes many opportunities for funding and institution-building efforts set forth by Brazilian governments and other key stakeholders worldwide. Debates and actions can benefit significantly from structured analyses, such as those made possible by the ICSI, based on evidence and objective indications.

Nonetheless, this paper expresses the initial stages of the research regarding the building of robust, valid, and trustable indicators of institutional capacities. The inclusion of data from more municipalities, other indicators, and more complex modeling are steps expected to be taken in the near future.

References

Acemoglu, D., & Robinson, J. (2009). Foundations of societal inequality. Science, 326(5953), 678-679.

Afonso, José Roberto, & Araújo, Everton Silva. (2019). Fiscal Policy and Environmental Taxes in Brazil: Challenges and Opportunities. International Policy Centre for Inclusive Growth (IPC-IG) Working Paper, No. 179. Brasília: UNDP.

Agranoff, R., & McGuire, M. (2003). Collaborative public management: New strategies for local governments. Georgetown University Press.

Andrews, R., & Boyne, G. A. (2010). Capacity, leadership, and organizational performance: Testing the black box model of public management. Public Administration Review, 70(3), 443–454.

Ansell, C., & Gash, A. (2008). Collaborative governance in theory and practice. Journal of Public Administration Research and Theory, 18(4), 543–571.

Arnstein, S. R. (1969). A ladder of citizen participation. *Journal of the American Institute of Planners*, 35(4), 216-224.

Azevedo, Ana M. (2016). Instrumentos de Governança Ambiental em Municípios Brasileiros: Desafios e Perspectivas. Dissertação de Mestrado, Universidade Federal de São Carlos (UFSCar).

Barros, R. B. G., & Ribeiro, H. (2009). Desigualdade social e segregação espacial: o caso da cidade de São Paulo. Saúde e Sociedade, 18(supl 1), 51-61.

Basu, K., & Palazzo, G. (2008). Corporate social responsibility: A process model of sensemaking. Academy of Management Review, 33(1), 122-136.

Benson, J. (2013). Environmental ethics: An introduction with readings. Routledge.

Berman, E., & Wang, X. (2000). Performance measurement in US counties: Capacity for reform. Public Administration Review, 60(5), 409–420.

Betsill, M. M., & Bulkeley, H. (2021). Cities and the multilevel governance of global climate change. In Understanding Global Cooperation (pp. 219-236). Brill.

Beyers, F., Leventon, J., & Heinrichs, H. (2023). Collaborative governance or state regulation? Endless efforts but little capacity for sustainability transformation of the German textile sector. Environmental Policy and Governance, 33(1), 56-77.

Bido, D. d. S., & Da Silva, D. (2019). SmartPLS 3: specification, estimation, evaluation and reporting. Administration: Teaching and Research, 20(2), 488-536.

Bido, D. S., Mantovani, D. M. N., & Cohen, E. D. (2017). Destruction of measurement scales through exploratory factor analysis in production and operations research. Gestão & Produção, 25, 384-397.

Bingham, L. B., Nabatchi, T., & O'Leary, R. (2005). The new governance: Practices and processes for stakeholder and citizen participation in the work of government. Public Administration Review, 65(5), 547–558.

Bouckaert, G. (2023). The neo-Weberian state: From ideal type model to reality? Max Weber Studies, 23(1), 13-59.

Bowman, A. O. M., & Kearney, R. C. (2011). *State and local government: The essentials*. Cengage Learning.

Braun, V., & Clarke, V. (2006). "Using Thematic Analysis in Psychology." Qualitative Research in Psychology, 3(2), 77–101.

Brundtland, G. H. (1987). Our common future-Call for action. Environmental conservation, 14(4), 291-294.

Bryson, J. M., Berry, F. S., & Yang, K. (2010). The state of public strategic management research: A selective literature review and set of future directions. The American Review of Public Administration, 40(5), 495–521.

Bulkeley, H., & Betsill, M. (2005). Rethinking sustainable cities: Multilevel governance and the'urban'politics of climate change. Environmental Politics, 14(1), 42-63.

Campbell, S. (1996). Green cities, growing cities, just cities? Urban planning and the contradictions of sustainable development. *Journal of the American Planning Association*, 62(3), 296–312.

Carroll, A. B. (1999). Corporate social responsibility: Evolution of a definitional construct. Business & Society, 38(3), 268-295.

Cartwright, G. (1998). Galveston: A history of the island. TCU Press.

Castán Broto, V., Trencher, G., Iwaszuk, E., & Westman, L. (2019). Transformative capacity and local action for urban sustainability. Ambio, 48, 449-462.

Chaskin, R. J. (2001). Building community capacity: A definitional framework and case studies from a comprehensive community initiative. Urban Affairs Review, 36(3), 291–323.

Cho, W., Kim, D., & YS Park, A. (2023). Local Government's Resource Commitment to Environmental Sustainability: Capacity, Conservatism, and Contractual Dynamics. Urban Affairs Review, 59(2), 447-475.

Cohen, J. (1988). Statistical power analysis for the behavioral sciences New York: Academic, 54.

Compact, U. G. (2004). Who cares wins: Connecting financial markets to a changing world. NY.
Conroy, M. M., & Berke, P. R. (2004). What makes a good sustainable development plan? An analysis of factors that influence principles of sustainable development. Environment and Planning A, 36(8), 1381–1396.
Cooper, H. (2016). Research Synthesis and Meta-Analysis: A Step-by-Step Approach. Sage.
Corbin, J., & Strauss, A. (2015). Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory. Sage Publications.
Creswell, J. W., & Creswell, J. D. (2018). Research Design: Qualitative, Quantitative, and Mixed Methods Approaches. Sage Publications.
Creswell, J. W., & Poth, C. N. (2017). Qualitative Inquiry and Research Design: Choosing Among Five Approaches. Sage Publications.
Crosby, B. C., & Bryson, J. M. (2018). Why leadership of public leadership research matters: and what to do about it. Public Management Review, 20(9), 1265–1286.
Cruz, Ricardo & Oliveira, Mariana. (2019). Governança Ambiental Municipal: Instrumentos e Práticas para a Sustentabilidade. Tese de Doutorado, Universidade Federal do Rio Grande do Sul (UFRGS).
Cunliffe, A. L. (2011). Crafting qualitative research: Morgan and Smircich 30 years on. Organizational research methods, 14(4), 647–673.
Cutter, S. L., Boruff, B. J., & Shirley, W. L. (2003). Social vulnerability to environmental hazards. Social Science Quarterly, 84(2), 242–261.
Daas, P., & Arends-Tóth, J. (2012). Secondary data collection. Statistics Netherlands. The Hague.
Daft, R., & Noe, R. (1997). Organization Theory and Behavior. In: Cincinnati: South-Western College Publishing.
Dahlström, C., Lapuente, V., & Teorell, J. (2010). Dimensions of bureaucracy: a cross-national dataset on the structure and behavior of public administration.
Dalmaijer, E. S., Nord, C. L., & Astle, D. E. (2022). Statistical power for cluster analysis. BMC bioinformatics, 23(1), 205.
Daly, H. E. (2015). Steady-state economics. In Thinking About the Environment (pp. 250–255). Routledge.
Denzin, N. K., & Lincoln, Y. S. (2018). The SAGE Handbook of Qualitative Research. Sage.
Deslatte, A., & Swann, W. L. (2017). Context matters: A Bayesian analysis of how organizational environments shape the strategic management of sustainable development. Public Administration, 95(3), 807-824.
Elkington, J. (1997). Cannibals with forks: The triple bottom line of 21st century business, Capstone. In: Oxford Capestone, London.
Emerson, K., Nabatchi, T., & Balogh, S. (2012). An integrative framework for collaborative governance. Journal of Public Administration Research and Theory, 22(1), 1–29.
Feiock, R. C., & Bae, J. (2011). Politics, institutions and entrepreneurship: City decisions leading to inventoried GHG emissions. Carbon Management, 2(4), 443-453.
Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. Journal of marketing research, 18(1), 39-50.
Frödin, O. (2015). Researching governance for sustainable development: Some conceptual clarifications. Journal of Developing Societies, 31(4), 447–466.
Galtung, J. (1973). 'The Limits to Growth'and Class Politics. Journal of Peace Research, 10(1-2), pp. 101–114.
George, G., Howard-Grenville, J., Joshi, A., & Tihanyi, L. (2016). Understanding and tackling societal grand challenges through management research. Academy of Management Journal, 59(6), 1880-1895.
Gonçalves, A. (2013). O crime ambiental no Brasil e os desafios da sua prevenção. Revista Brasileira de Ciências Criminais, 21(99), 233-263.
Gonçalves, Priscila. (2017). Planos e Programas Ambientais Municipais: Instrumentos para a Proteção do Meio Ambiente. Cadernos de Estudos Ambientais, 13(1), 34-50.

Greeff, G., & Ghoshal, R. (2004). Practical E-manufacturing and supply chain management. Elsevier.

Hahn, T., & Figge, F. (2011). Beyond the bounded instrumentality in current corporate sustainability research: Toward an inclusive notion of profitability. JOURNAL OF BUSINESS ETHICS, 104(3), 325-345.

Hahn, T., Preuss, L., Pinkse, J., & Figge, F. (2014). Cognitive frames in corporate sustainability: Managerial sensemaking with paradoxical and business case frames. Academy of Management Review, 39(4), 463-487.

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). Multivariate Data Analysis. Pearson.

Hawkins, C. V., Krause, R. M., Feiock, R. C., & Curley, C. (2016). Making meaningful commitments: Accounting for variation in cities' investments of staff and fiscal resources to sustainability. Urban Studies, 53(9), 1902-1924.

Helfat, C. E., Finkelstein, S., Mitchell, W., Peteraf, M., Singh, H., Teece, D., & Winter, S. G. (2009). Dynamic capabilities: Understanding strategic change in organizations. John Wiley & Sons.

Hölscher, K., & Frantzeskaki, N. (2020). Conclusions: Bridging and Weaving Science and Policy Knowledges for a Research Agenda to Transform Climate Governance. Transformative Climate Governance: A Capacities Perspective to Systematize, Evaluate and Guide Climate Action, 447-476.

Homer-Dixon, T. F. (1994). Environmental scarcities and violent conflict: Evidence from cases. International Security, 19(1), 5–40.

Homsy, G. C., & Warner, M. E. (2015). Cities and sustainability: Polycentric action and multilevel governance. Urban Affairs Review, 51(1), 46–73.

Honadle, G. H. (1981). Fishing for sustainability: the role of capacity building in development administration.

Ingraham, P. W., Joyce, P. G., & Donahue, A. K. (2003). Government performance: Why management matters. Taylor & Francis.

Iqbal, K. M. J., Akhtar, N., Khan, M. O., & Khan, M. I. (2022). Mix-method modelling of actors' capacity for environmental sustainability and climate compatible development in energy sector. Environmental Science and Pollution Research, 29(33), 50632-50646.

James, L. (1979). Gaia: A new look at life on earth. In: Oxford University Press, Oxford.

Jänicke, M. (1997). The political system's capacity for environmental policy. In National environmental policies: A comparative study of capacity-building (pp. 1–24). Springer.

Kahn, M. E. (2007). Green cities: urban growth and the environment. Rowman & Littlefield.

Kattel, R., & Mazzucato, M. (2018). Mission-oriented innovation policy and dynamic capabilities in the public sector. In (Vol. 27, pp. 787-801): Oxford University Press.

Kaufmann, D., & Kraay, A. (2023). WGI, Worldwide Governance Indicators (www.govindicators.org)

Kim, H. W., & Li, M.-H. (2017). Managing stormwater for urban sustainability: An evaluation of local comprehensive plans in the Chesapeake Bay watershed region. Journal of Environmental Planning and Management, 60(10), 1702-1725.

Krause, R. M., Feiock, R. C., & Hawkins, C. V. (2016). The administrative organization of sustainability within local government. Journal of Public Administration Research and Theory, 26(1), 113–127.

Krause, R. M., Hawkins, C. V., & Park, A. Y. (2021). The perfect amount of help: An examination of the relationship between capacity and collaboration in urban energy and climate initiatives. Urban Affairs Review, 57(2), 583–608.

Lafferty, W. M., & Hovden, E. (2003). Environmental policy integration: Towards an analytical framework. *Environmental Politics*, 12(3), 1-22.

Latour, B. (2018). Gaia 2.0: Could humans add some level of self-awareness to Earth's self-regulation? Science, 361(6407), 1066–1068.

Liao, L., Warner, M. E., & Homsy, G. C. (2020). When do plans matter? Tracking changes in local government sustainability actions from 2010 to 2015. Journal of the American Planning Association, 86(1), 60–74.

Lima, Ana P., & Rocha, Gustavo. (2016). Governança Ambiental e Enforcement em Municípios Brasileiros: Uma Abordagem Teórica e Empírica. Caderno de Estudos Urbanos e Regionais, 18(2), 123-142.

Loorbach, D., & Verbong, G. (2012). Conclusion: is governance of the energy transition a reality, an illusion or a necessity? In Governing the energy transition (pp. 317-335). Routledge.

Lubell, M., Feiock, R., & Handy, S. (2009). City adoption of environmentally sustainable policies in California's Central Valley. Journal of the American Planning Association, 75(3), 293–308.

Lubell, M., Feiock, R. C., & De La Cruz, E. E. R. (2009). Local institutions and the politics of urban growth. American Journal of Political Science, 53(3), 649-665.

Maricato, E. (2001). O impasse da política urbana no Brasil. Parcerias Estratégicas, 6(12), 19-35.

Maxwell, J. A. (2012). A Realist Approach for Qualitative Research. Sage Publications.

Mazmanian, D. A., & Kraft, M. E. (2009). *Toward sustainable communities: Transition and transformations in environmental policy*. MIT

Mendonça, Rodrigo & Cardoso, Fabiana. (2020). Instrumentos e Mecanismos de Governança Ambiental em Municípios: Uma Análise Crítica. Congresso Brasileiro de Meio Ambiente, Anais, pp. 187-202.

Miles, M. B., Huberman, A. M., & Saldaña, J. (2014). Qualitative Data Analysis: A Methods Sourcebook. Sage Publications.

Mintzberg, H., Raisinghani, D., & Theoret, A. (1976). The structure of" unstructured" decision processes. Administrative Science Quarterly, 246-275.

Nellemann, C., Henriksen, R., Raxter, P., Ash, N., & Mrema, E. (Eds.). (2014). The environmental crime crisis: Threats to sustainable development from illegal exploitation and trade in wildlife and forest resources. United Nations Environment Programme (UNEP).

North, D. C., Wallis, J. J., & Weingast, B. R. (2009). Violence and social orders: A conceptual framework for interpreting recorded human history. Cambridge University Press.

O'Connell, L. (2009). The impact of local supporters on smart growth policy adoption. Journal of the American Planning Association, 75(3), 281–291.

Ostrom, E. (2009). A general framework for analyzing sustainability of social-ecological systems. Science, 325(5939), 419–422.

Ostrom, E. (2010). Beyond markets and states: Polycentric governance of complex economic systems. *American Economic Review*, 100(3), 641–672.

Ottman, J. A., Stafford, E. R., & Hartman, C. L. (2006). Avoiding green marketing myopia: Ways to improve consumer appeal for environmentally preferable products. *Environment: Science and Policy for Sustainable Development*, 48(5), 22-36.

Pahl-Wostl, C. (2017). An evolutionary perspective on water governance: From understanding to transformation. Water Resources Management, 31, 2917-2932.

Park, Y. J., Kim, Y., & Chen, G. (2022). Financial capacity and organizational stability in US local governments. Public Management Review, 24(3), 418-441.

Pfeffer, J., & Salancik, G. R. (1978). The external control. New York.

Pires, R. R. C., & Gomide, A. d. Á. (2016). Governance and state capacities: a comparative analysis of federal programs. Revista de Sociologia e Politica, 24(58), 121-143.

Popay, J., Roberts, H., Sowden, A., Petticrew, M., Arai, L., Rodgers, M., ... & Duffy, S. (2006). Guidance on the Conduct of Narrative Synthesis in Systematic Reviews. ESRC Methods Programme.

Porter, M. E., & van der Linde, C. (1995). Toward a new conception of the environment-competitiveness relationship. Journal of Economic Perspectives, 9(4), 97-118.

Portney, K. (2005). Civic engagement and sustainable cities in the United States. Public Administration Review, 65(5), 579–591.

Portney, K. E., & Berry, J. M. (2010). Participation and the pursuit of sustainability in US cities. Urban Affairs Review, 46(1), 119–139.
Pritchett, L., Woolcock, M., & Andrews, M. (2013). Looking like a state: techniques of persistent failure in state capability for implementation. The Journal of Development Studies, 49(1), 1–18.
Rauch, J. E., & Evans, P. B. (2000). Bureaucratic structure and bureaucratic performance in less developed countries. Journal of Public Economics, 75(1), 49–71.
Rennings, K. (2000). Redefining innovation—eco-innovation research and the contribution from ecological economics. *Ecological Economics*, 32(2), 319–332.
Reuveny, R. (2007). Climate change-induced migration and violent conflict. Political Geography, 26(6), 656–673.
Ringle, C. M., Da Silva, D., & de Souza Bido, D. (2014). Structural equation modeling using SmartPLS. REMark-Revista Brasileira de Marketing, 13(2), 56-73.
Rodrik, D., Subramanian, A., & Trebbi, F. (2004). Institutions rule the primacy of institutions over geography and integration in economic development. JOURNAL OF ECONOMIC GROWTH, 9, 131-165.
Saidu, M., Shagari, S. L., Kabir, M. A., & Abubakar, A. (2023). Improving University Students' Data Analysis Outputs through Effective Data Collection, Cleaning, Screening and Normalization. Applied Quantitative Analysis, 3(2), 32-45.
Salt, D., & Walker, B. (2006). Resilience thinking: sustaining ecosystems and people in a changing world. Island Presse.
Sarabia, N., & Peris, J. (2024). Emergence and Development of Transformative Capacities for the Sustainability of the Agri-Food System: The Process in Valdivia, Chile. Sustainability (Switzerland), 16(11), 4849.
Seroa da Motta, Ronaldo. (2002). Environmental Fiscal Reform and Its Implications for Sustainable Development in Brazil. Texto para Discussão n. 894. Instituto de Pesquisa Econômica Aplicada (IPEA), Brasília.
Silva, Luis C. (2020). Desafios do Enforcement Ambiental em Municípios Brasileiros: Uma Análise das Políticas Públicas e Instituições. Revista Brasileira de Política Ambiental, 4(1), 45-67.
Silva, Marcos Antônio. (2018). Instrumentos de Políticas Ambientais Municipais no Brasil: Avaliação e Propostas. Revista Brasileira de Política Ambiental, 6(2), 58-74.
Sharp, E. B., Daley, D. M., & Lynch, M. S. (2011). Understanding local adoption and implementation of climate change mitigation policy. Urban Affairs Review, 47(3), 433-457.
Skocpol, T. (1979). State and revolution: Old regimes and revolutionary crises in France, Russia, and China. Theory and Society, pp. 7, 7–95.
Skocpol, T. (1988). Social revolutions and mass military mobilization. World Politics, 40(2), 147–168.
Svendsen, G. L. H., & Svendsen, G. T. (2004). The creation and destruction of social capital: entrepreneurship, co-operative movements, and institutions. Edward Elgar Publishing.
Swann, W. L. (2017). Examining the impact of local collaborative tools on urban sustainability efforts: Does the managerial environment matter? The American Review of Public Administration, 47(4), 455–468.
Swann, W. L., & Deslatte, A. (2019). What do we know about urban sustainability? A research synthesis and nonparametric assessment. Urban Studies, 56(9), 1729-1747.
Tashakkori, A., & Teddlie, C. (2010). SAGE Handbook of Mixed Methods in Social & Behavioral Research. Sage Publications.
Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. Strategic Management Journal, 18(7), 509-533.
Transparence-Portal. (2022). Transparency Panel Brazil. https://portaldatransparencia.gov.br/

Ullmann, T., Hennig, C., & Boulesteix, A. L. (2022). Validation of cluster analysis results on validation data: A systematic framework—Wiley Interdisciplinary Reviews: Data Mining and Knowledge Discovery, 12(3), e1444.

Valentini, F., & Damásio, B. F. (2016). Average variance extracted and composite reliability: indicators of precision. Psychology: Theory and research, 32, e322225.

Vieille Blanchard, E. (2010). Modelling the future: an overview of the 'Limits to growth' debate. Centaurus, 52(2), 91-116.

Wang, X., Hawkins, C. V., Lebredo, N., & Berman, E. M. (2012). Capacity to sustain sustainability: A study of US cities. Public Administration Review, 72(6), 841-853.

Wang, X., Van Wart, M., & Lebredo, N. (2014). Sustainability leadership in a local government context: The administrator's role in the process. Public Performance & Management Review, 37(3), 339-364.

WHO (2105). World report on Ageing and Health https://iris.who.int/bitstream/handle/10665/186463/9789240694811_eng.pdf;jsessionid=93029DCD99AF31567AEFFD726C9D7552?sequence=1

Wilson, D. (1989). Toward a revised urban managerialism: Local managers and community development block grants. Political Geography Quarterly, 8(1), 21–41.

Wolfram, M., & Frantzeskaki, N. (2016). Cities and systemic change for sustainability: Prevailing epistemologies and an emerging research agenda. Sustainability (Switzerland), 8(2), 144.

Yin, R. K. (2018). Case Study Research and Applications: Design and Methods. Sage Publications.

Zeemering, E. S. (2021). Sustainability management, strategy and reform in local government. In Sustainable Public Management (pp. 141-158). Routledge.