

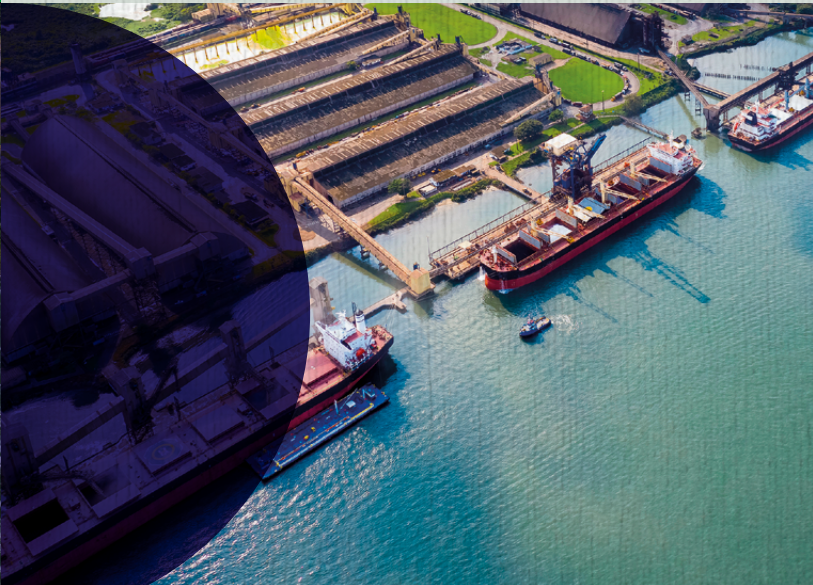


Confea's
Infrastructure
Index for Brazil

EXECUTIVE REPORT



CONFEA
Conselho Federal de Engenharia
e Agronomia



INFRA BR

Confea's Infrastructure Index for Brazil

EXECUTIVE REPORT

Version 1 – March 2026



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e Agronomia

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PRESIDENT'S MESSAGE

Brazil needs to plan again. And planning well means approaching infrastructure with data, long-term vision and technically sound decisions. It is precisely in this context that INFRA-BR emerges - an initiative that seeks to organize information, indicators and analyses on Brazilian infrastructure to support smarter choices for the country's development.

In a continental country such as Brazil, understanding where the bottlenecks and opportunities in infrastructure lie is not merely a technical task - it is a strategic necessity. Roads, sanitation, energy, mobility and logistics directly affect the quality of life of the population, the competitiveness of the economy and the capacity to reduce regional inequalities.

INFRA-BR arises precisely to help illuminate this path. By bringing together data and indicators on national infrastructure, the initiative creates a solid foundation for government, the productive sector and society to discuss investment priorities with greater clarity, accountability and forward-looking vision.

Beyond measuring existing infrastructure, INFRA-BR proposes something even more important: strengthening a culture of planning in Brazil. Countries that develop do not improvise. They plan, prioritize and execute.

Brazilian engineering plays a central role in this process. It is the professionals in technological fields who transform projects into works, planning into development, and investment into quality of life for the population.

With INFRA-BR, Confea reaffirms its commitment to placing technical knowledge at the service of the country. Because discussing infrastructure is, at its core, discussing the future of Brazil.

Telecommunications Engineer
Vinicius Marchese
President of Confea







TABLE OF CONTENTS

6	Introduction
7	1. Methodology
12	2. How to Interpret the Results: Usage Limitations and Precautionary Notes
13	3. Main Findings
16	3.1 Energy and Connectivity
19	3.2 Mobility
22	3.3 Water
25	3.4 Social Well-Being and Citizenship
28	3.5 Environment and Resilience
31	3.6 Basic Sanitation
34	Final Considerations
36	References
39	ANNEX 1 – Data Sources and Variable Details



INTRODUCTION

Infrastructure is an indispensable foundation for economic development, global competitiveness and social well-being. Without clear metrics, there is a risk of concentrating efforts solely on the execution of works and financial allocation, without knowing whether such actions actually result in tangible benefits for the population. In this regard, Confea proposes, through INFRA-BR, to improve the debate on infrastructure quality and to promote evidence-based management cultures by equipping decision-makers with a robust tool that offers an integrated sectoral perspective.

Thinking about infrastructure in contemporary Brazil requires consideration, besides the volume of investments, of how these resources are articulated with sustainable development and produce measurable impacts. In a vast, unequal country historically marked by limited planning capacity, measurement also functions as an instrument of governance, transparency, accountability and evidence-based decision-making.

INFRA-BR is an index that evaluates infrastructure performance for the 27 Federative Units of Brazil in a multidimensional manner. The index is grounded in the understanding that sustainable investment in infrastructure must occur in a transdisciplinary and systemic manner, so that the quality of assets and public services can be assessed across six major dimensions in each Federative Unit:



1. METHODOLOGY



INFRA-BR is composed of 67 indicators (Table 1), divided into six major dimensions. The data for each indicator (source, reference year, and other details) can be found in Annex 1 of this report. The INFRA-BR calculation methodology followed the steps presented below. For a deeper understanding of the methodological choices and statistical details, readers are encouraged to consult the INFRA-BR Methodological Report, available on the official index website.¹

1. **Selection and validation of indicators:** Indicators were selected based on conceptual and empirical criteria, prioritising thematic relevance, capacity to measure outcomes or functional proxies, availability in public databases and territorial comparability. This process is grounded in the mapping and extraction of data from official sources, in which administrative records and microdata are consolidated in a single environment.
2. **Preliminary data processing:** Data undergo statistical treatment to ensure robustness and comparability:
 - Extreme values (outliers): treated by truncation at upper percentiles (e.g. 99th percentile), limiting their influence without excluding them from the sample;
 - Scale transformation and skewness reduction: indicators with strongly skewed distribution or high dispersion may

undergo logarithmic transformations (e.g., $\log(x+1)$) to approximate their distribution to normality and to reduce the influence of extreme values, improving the stability of subsequent calculations;

- Missing values: imputation is performed using time-series methods (e.g., historical state average) or predictive techniques, selected based on minimisation of the mean squared error, thus preserving temporal and territorial consistency².
3. **Categorization of specific indicators:** Indicators with high dispersion, marked skewness or ordinal nature may be transformed into hierarchical categories (e.g., Low, Medium, High). This categorization reduces statistical noise and improves comparability, being useful for risk, criticality or environmental impact indicators.
 4. **Definition of upper and lower bounds:** For every indicator, limits are established considering the best scenario (upper bound) and worst scenario (lower bound), based on the sigmoid function.
 5. **Variable orientation and normalization:** All indicators are oriented in the same direction, so that higher values represent better performance. Originally negative indicators are inverted. Subsequently, the data is normalized, enabling comparison between variables with different units and scales.
 6. **Sample adequacy test:** For each component, the Kaiser-Meyer-Olkin (KMO) test is applied to verify whether the correlation structure among the indicators is adequate for the application of multivariate techniques.
 7. **Weight definition by Principal Component Analysis (PCA):** The **weight of each** indicator is defined using PCA. This technique identifies the relative contribution of each indicator to the total variance, providing a statistical basis for weighting and reducing arbitrariness.
 8. **Internal consistency assessment:** The internal consistency of each component is assessed using Cronbach's Alpha, indicating the degree of cohesion among its indicators and reinforcing the reliability of the aggregation.
 9. **Score calculation by indicator and index aggregation:** Component scores are calculated by the weighted combination of indicators. Finally, the INFRA-BR index is composed from its dimensions by simple averaging (equal weights) of their respective components, ensuring balanced treatment across all axes.



The data presented on maps occurs through data categorization - a technique that groups similar elements into categories to facilitate analysis, interpretation and use of information. For each dimension assessed, a maximum and minimum score was assigned, and the interval between these was divided into 5 tiers, each represented by a different color (each encompassing a set of 5 to 6 Brazilian Federative Units), homogenizing the analysis into groups of approximately equal sizes. Finally, to calculate the national INFRA-BR average across its components and dimensions, a weighted average of the Federative Units performance by their demographic density (population size) was applied.



Table 1: INFRA-BR indicator grid, organized into its six dimensions and respective components and indicators.

ENERGY AND CONNECTIVITY	MOBILITY	WATER	SOCIAL WELL-BEING AND CITIZENSHIP	ENVIRONMENT AND RESILIENCE	BASIC SANITATION
TELECOMMUNICATIONS 1. Broadband connection quality 2. Telecommunications capacity and coverage 3. Mobile signal coverage (4G and 5G) ENERGY GENERATION 1. Total energy generation 2. Granted power capacity 3. Diversity of the energetic matrix ENERGY TRANSMISSION 1. Transmission line extension 2. Transformation capacity ENERGY DISTRIBUTION 1. Average Equivalent Interruption Frequency (FEC) 2. Average Equivalent Interruption Duration (DEC) 3. Average energy consumption per capita	INTRA-MUNICIPAL TRANSIT 1. Bus service quality 2. Cycling infrastructure 3. Presence of high-capacity transit 4. Modal diversity index PORTS 1. Port throughput volume 2. Average handling productivity 3. Average waiting time for berthing CARGO FLOW 1. Volume transported by cabotage 2. Revenue from logistics activities (waterway, air, rail and road) 3. Rail tonne-kilometre (TKU) 4. Inland waterway transport volume HIGHWAYS 1. Road geometry quality 2. State highway quality 3. Condition and Maintenance Index (CMI) of federal highways 4. Road accident mortality rate AIRPORTS 1. Installed air traffic capacity 2. Airport network connectivity 3. Aerodrome density	WATER QUALITY 1. Microbiological compliance 2. Residual chlorine compliance WATER DISTRIBUTION 1. Access to the public water network 2. Rural distribution rate 3. Urban distribution rate 4. Water distribution efficiency	HEALTH 1. Proportion of healthcare facilities per population 2. Total medical equipment 3. Hospital beds per population EDUCATION 1. Sanitary accessibility for Persons with Disabilities (PwD) in schools 2. Drinking water supply coverage in schools 3. Percentage of schools with broadband internet access 4. Science teaching infrastructure 5. Density of computing equipment HOUSING & URBAN INFRASTRUCTURE 1. Housing with paved surroundings 2. Availability of private bathrooms 3. Constructive adequacy of housing 4. Housing deficit SOCIAL ASSISTANCE 1. Average score in the Index of Social Assistance Reference Centers Development (IDCRAS) 2. Average score in the Index of Specialized Social Assistance Reference Centers Development (IDCREAS) CULTURE, LEISURE AND SPORT 1. Squares and parks in urban areas 2. Proportion of schools with library or reading room 3. Proportion of schools with sports court 4. Proportion of museums per population	CLIMATE ADAPTATION AND RESILIENCE 1. Proportion of municipalities with stormwater drainage and management planning 2. Adaptive capacity index 3. Dam safety 4. Reduction of gross greenhouse gas emissions (CO ₂ e) 5. Water bodies and wetlands coverage VEGETATION COVER AND CONSERVATION 1. Urban green areas 2. Total degradation rate 3. Degree of urban impermeability	SOLID WASTE 1. Adequacy of final waste disposal 2. Solid waste collection coverage 3. Recyclable material recovery rate SEWAGE 1. Coverage of collected sewage treatment 2. Total sewage service coverage 3. Sewage system adequacy

Despite the large volume of statistical databases and sector-specific records available, Brazil still lacks a set of infrastructure indicators produced in a systematic, inter-Federative Units comparable manner and with regular temporal updates, allowing the evaluation of the quality of infrastructure provided in municipalities and Federative Units as a whole – beyond merely investments made. In some axes mapped by INFRA-BR, the construction of the index required combinations of proxies and harmonization of series, which highlights both the dispersed informational richness and the gaps in precisely monitoring service quality, operational performance and social outcomes associated with infrastructure. This asymmetry means that the public debate often remains anchored in input or infrastructure-stock metrics, to the detriment of finer indicators on access, reliability, safety and distributive impacts.

A clear example is presented by road bridge data – a critical asset of transport infrastructure. Although Brazil has relevant efforts in bridge inventory and inspection, the gap in systematic and publicly accessible data on quality conditions becomes even more sensitive given that these structures function as critical links in the road network, and their failure can completely interrupt flows of people, goods and services. In short, it is currently possible to know “how many” bridges exist in certain administrative jurisdictions or concessioned networks, but there is no consolidated national and comparable information on their conservation status, structural performance, associated risk and adequacy of preventive and corrective maintenance.

The consolidation of INFRA-BR as a multidimensional diagnostic tool tends to generate clearer and more organized demand for indicators that currently do not exist or are produced with low frequency, which helps to set agendas for statistical improvement in the different information-producing agencies. In other words, the repeated use of INFRA-BR by managers, professional councils, oversight bodies and civil society can act as a vector of institutional pressure for more complete, disaggregated and timely series. In this way, INFRA-BR ceases to be merely a snapshot of the current state of physical infrastructure and also begins to guide the development of a more robust, transparent and evidence-based information ecosystem aligned with the demands of evidence-based management.



2. HOW TO INTERPRET THE RESULTS: USAGE LIMITATIONS AND PRECAUTIONARY NOTES

This section aims to guide INFRA-BR users regarding the appropriate interpretation of the index results, the risks of misuse and the precautions necessary when comparing Federative Units.

Comparability itself is methodologically sensitive and requires prior clarification regarding the objectives and criteria of comparison. First, it is essential to verify whether the phenomena analyzed are equivalent in nature and whether the indicators used have compatible denominators. In the case of INFRA-BR, the technical team carried out statistical standardization of the variables, converting absolute values into measures relative to population, territory or other pertinent reference bases, with the aim of ensuring formal comparability.

However, comparability does not end with statistical standardization. Brazilian Federative Units have distinct historical trajectories, institutional capacities, economic structures and political-administrative arrangements, even though they share the same institutions and federal arrangement. Thus, comparisons between states must consider that observed differences may reflect not only infrastructural performance but also diverse contexts.

To mitigate the risks of inadequate interpretations, it is recommended that the primary form of analysis be longitudinal – namely, comparing the Federative Unit with itself over time. This approach allows for the observation of internal variations in the set of variables composing the index, favoring more consistent diagnoses regarding evolution, stagnation or regression in certain dimensions within the same territory.

Inter-state comparisons are methodologically feasible and may be useful for identifying patterns and disparities. However, they must be conducted without prior normative judgements. The results should be interpreted as a starting point for analytical investigation – that is, as indications that raise questions about the factors explaining a given performance. It should be reiterated that synthetic indexes constitute instruments of measurement and signaling; they do not offer, by themselves, causal explanations for the observed phenomena.

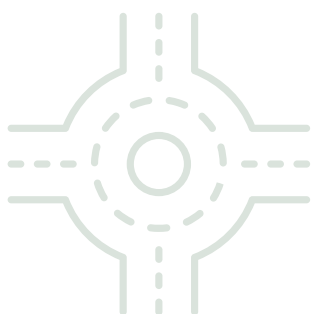


3. MAIN FINDINGS

Considering the average score of each infrastructure dimension, INFRA-BR presents an unequal Brazil. While states in the Southeast, South and Central-West regions lead the ranking, states in the North region occupy the lower positions.

The overall index result (Table 2) shows the top-ranked unit (Distrito Federal) with 74.67 points, while the lowest performance (Acre) recorded 28.46 points. The national average score is 56.92 points. If Brazil were to appear in the overall results map, it would occupy 9th place in the ranking.





Federative Unit	INFRA-BR 2026 Result	Ranking
Distrito Federal - DF	74.67	1
São Paulo - SP	68.49	2
Rio de Janeiro - RJ	65.84	3
Santa Catarina - SC	65.24	4
Paraná - PR	64.8	5
Minas Gerais - MG	63.59	6
Rio Grande do Sul - RS	59.58	7
Espírito Santo - ES	57.01	8
Goiás - GO	56.19	9
Mato Grosso - MT	55.20	10
Mato Grosso do Sul - MS	53.81	11
Sergipe - SE	51.39	12
Ceará - CE	49.3	13
Bahia - BA	47.86	14
Tocantins - TO	47.7	15
Rondônia - RO	46.52	16
Paraíba - PB	45.28	17
Alagoas - AL	44.24	18
Rio Grande do Norte - RN	44.00	19
Pernambuco - PE	43.02	20
Piauí - PI	41.10	21
Roraima - RR	37.66	22
Maranhão - MA	36.84	23
Amazonas - AM	36.61	24
Pará - PA	34.41	25
Amapá - AP	33.94	26
Acre - AC	28.46	27

Table 2: INFRA-BR results for each Federative Unit, ranked from highest (ranking 1) to lowest (ranking 27) result.

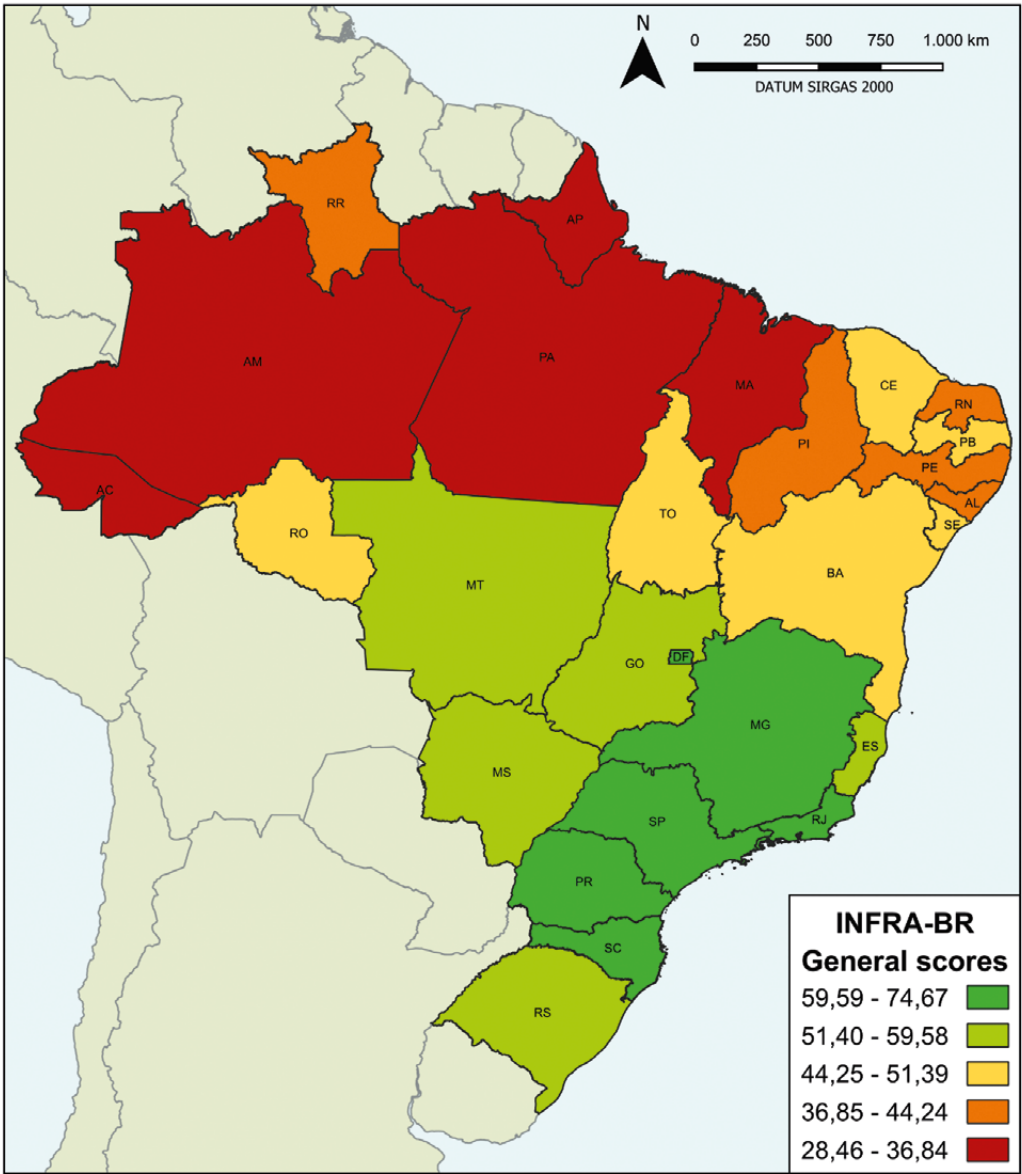


Figure 1: INFRA-BR map for the 27 Federative Units.





3.1 Energy and Connectivity

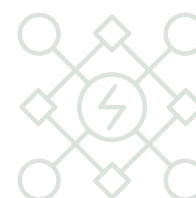
The Energy and Connectivity dimension is structured on the understanding that energy security and access to telecommunications infrastructure constitute fundamental pillars for the maintenance of economic activity, the provision of essential services and the reduction of territorial inequalities. The integrated analysis of this dimension is based on the understanding that energy security results from the interaction between availability, accessibility, sustainability and the capacity to respond to disruptions.

- The components assessed in this dimension are:
- Energy distribution;
- Energy generation;
- Energy transmission; and
- Telecommunications.



INFRA-BR Dimension Energy and Connectivity	Ranking	Federative Unit
78.31	1	SP
75.12	2	RJ
71.70	3	PR
71.34	4	SC
70.43	5	MG
66.84	6	DF
66.08	7	RN
63.70	8	RS
56.72	9	ES
55.90	10	SE
54.92	11	BA
51.88	12	PB
51.18	13	PI
50.03	14	PE
49.48	15	GO
48.80	16	MT
46.86	17	RO
46.30	18	CE
45.58	19	MS
42.73	20	AL
42.56	21	MA
38.41	22	PA
33.72	23	TO
25.37	24	AP
22.59	25	AC
19.04	26	RR
17.45	27	AM

Table 3: Results of the Energy and Connectivity dimension of INFRA-BR for each Federative Unit.



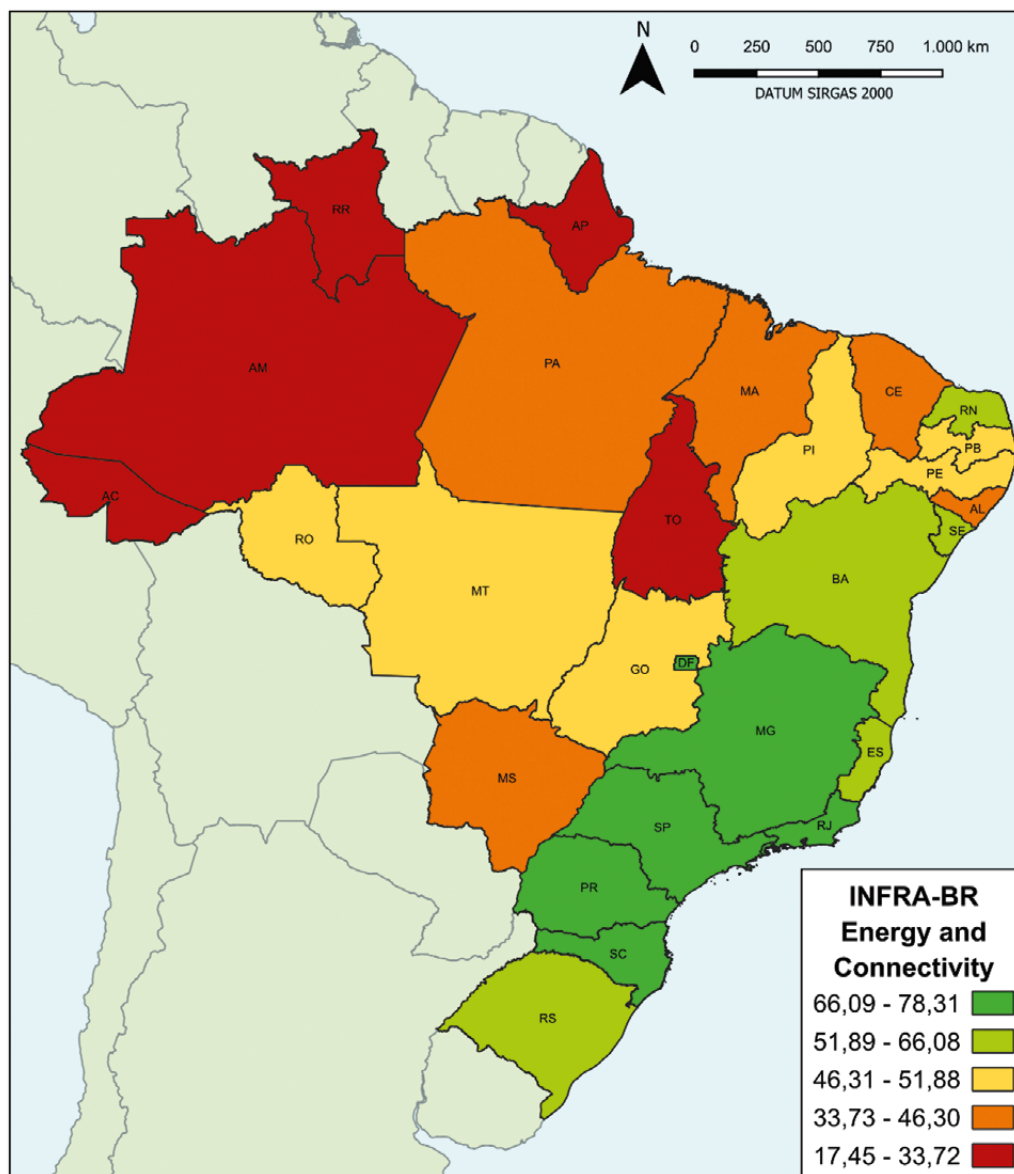


Figure 2: Map of the Energy and Connectivity dimension of INFRA-BR for the 27 Federative Units.

The national average score of this dimension is 61.82 points, which would occupy position 9 in the national ranking. The results of the Energy and Connectivity dimension reveal strong regional disparities. States in the Southeast and South, such as SP, RJ, PR, SC and MG, occupy the top positions, driven by consolidated transmission networks, high generation capacity and greater density of telecommunications infrastructure. At the other end, Federative Units in the North region and parts of the Northeast show significantly lower scores, reflecting challenges of universal access,

greater dependence on isolated systems and limitations in broadband supply in remote areas. The difference between the best and worst performances indicates that policies for network expansion, system modernization and reduction of vulnerabilities in disruption events are crucial to mitigate territorial asymmetries and sustain economic activity across the country.

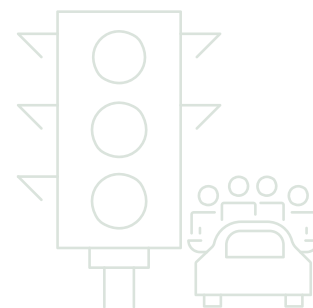


3.2 Mobility

The **Mobility** dimension was conceived to capture, in an integrated manner, the conditions for the movement of people and the flow of cargo across the national territory, considering both physical infrastructure and aspects of capacity, efficiency, safety and intermodal integration. It is based on the understanding that mobility constitutes a fundamental structural component of economic and social development, by enabling access to opportunities, reducing logistics costs, expanding territorial connectivity and sustaining production chains.

The components assessed in this dimension are:

- Intra-municipal transit;
- Ports;
- Cargo flow;
- Highways;
- Airports.





INFRA-BR Dimension Mobility	Ranking	Federative Unit
75.85	1	DF
70.26	2	RJ
66.43	3	SP
58.81	4	CE
55.77	5	PE
55.27	6	SE
54.07	7	ES
52.96	8	AL
52.25	9	PB
51.14	10	MG
49.30	11	PR
48.92	12	SC
48.41	13	MS
47.54	14	RN
46.01	15	AC
45.89	16	BA
45.82	17	MA
45.51	18	PA
44.45	19	RR
43.28	20	GO
41.11	21	PI
40.33	22	RO
37.90	23	TO
36.61	24	MT
36.45	25	AM
35.26	26	RS
33.83	27	AP

Table 4: Results of the Mobility dimension of INFRA-BR for each Federative Unit.



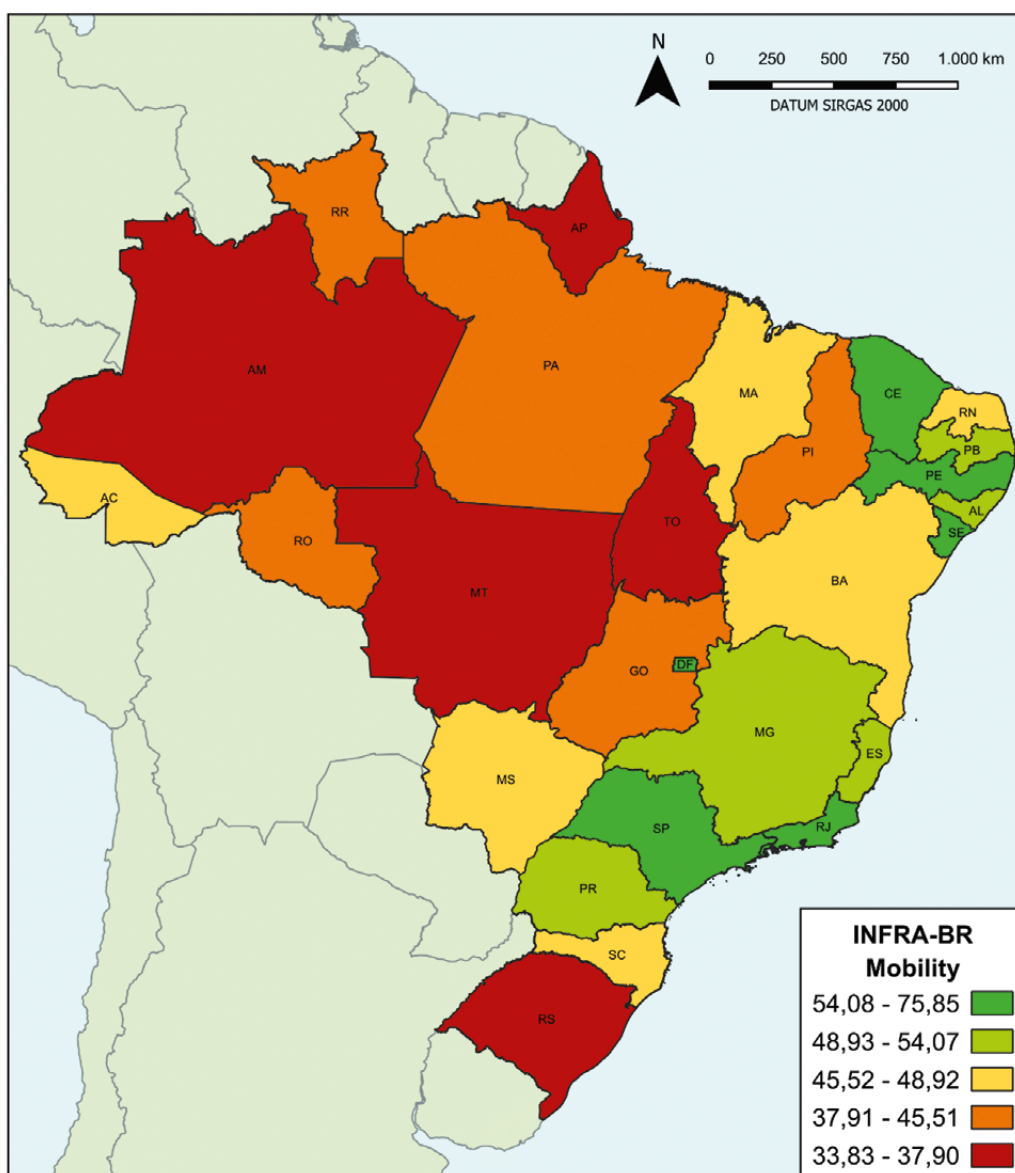


Figure 3: Map of the Mobility dimension of INFRA-BR for the 27 Federative Units.

The national average score of this dimension is 53.84 points, which would occupy position 8 in the national ranking. In the Mobility dimension, INFRA-BR reveals a scenario in which Federative Units with a higher degree of urbanization and denser paved road networks tend to obtain better results, as evidenced particularly by DF, RJ, SP and CE in the top positions of the ranking. In contrast, states in the North region and part of the Central-West concentrate the lowest scores, reflecting extensive territorial voids, greater dependence on unpaved roads and high logistics

costs. In light of this territorial pattern of results, addressing mobility bottlenecks requires not only network expansion, but also multimodal integration strategies and the upgrading of public transport.

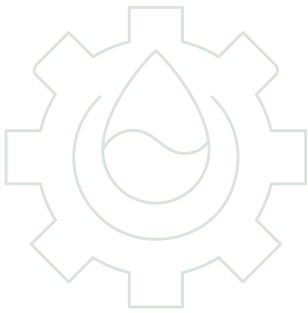


3.3 Water

In the Water dimension, the primary focus falls on water availability for human consumption, concentrating on supply systems and on the quality and participation of water circuits in ecosystem balance. This is based on the understanding that water infrastructure is not limited to the capture or volume produced; it is related in the capacity to distribute water continuously, safely and in an environmentally sustainable manner.

The components assessed in this dimension are:

- Water quality;
- Water distribution.



INFRA-BR Dimension Water	Ranking	Federative Unit
73.07	1	SP
73.04	2	DF
72.30	3	SC
70.30	4	GO
69.68	5	MS
67.11	6	TO
66.44	7	MT
66.24	8	BA
65.23	9	MG
61.87	10	PR
61.66	11	RS
61.10	12	ES
55.57	13	RJ
54.67	14	CE
54.30	15	SE
47.62	16	RR
44.79	17	AM
44.42	18	PI
40.10	19	PE
40.00	20	PB
37.92	21	AL
36.22	22	MA
32.09	23	RO
29.20	24	RN
22.43	25	AC
20.44	26	AP
13.59	27	PA

Table 5: Results of the Water dimension of INFRA-BR for each Federative Unit.



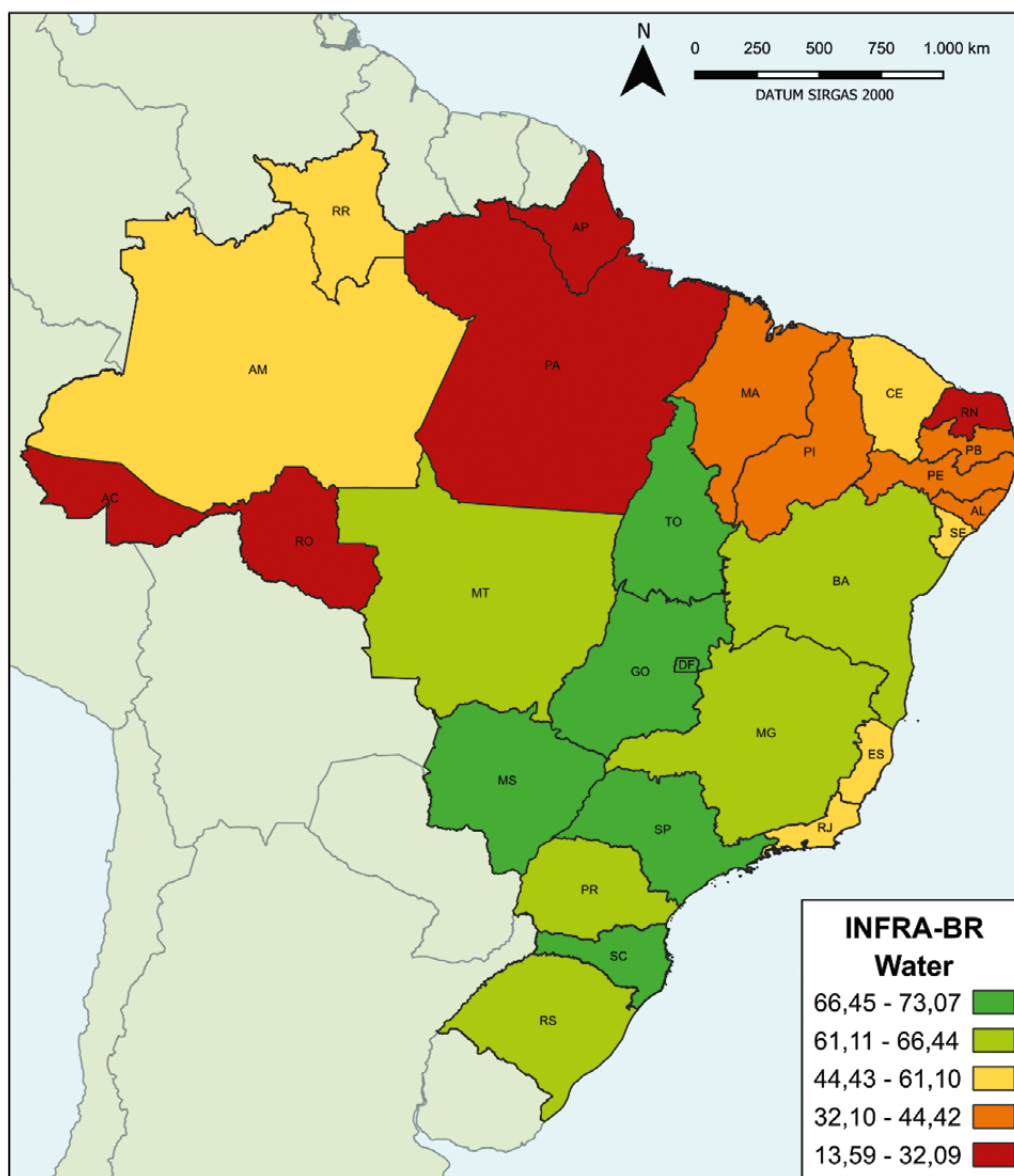


Figure 4: Map of the Water dimension of INFRA-BR for the 27 Federative Units.

The national average score of this dimension is 58.74 points, which would occupy position 13 in the national ranking. The results of the Water dimension show that access to and quality of supply services are still marked by structural inequalities. States with greater network coverage, lower distribution loss indices and better water quality monitoring tend to rank in the upper strata of the ranking, as illustrated by SP, DF, SC, GO, MS and TO – in dark green on the map. On the other hand, Federative Units with historical deficits in water infrastructure, such as PA, AP, AC,



RN and RO, show the lowest scores, reflecting weaknesses in both the availability and regularity of the service. The observed differences indicate the need for policies focused on loss reduction, expanding coverage in vulnerable territories and strengthening regulation and institutional capacity of service providers, so as to ensure the right to water on an equitable basis.



3.4 Social Well-being and Citizenship

The Social Well-being and Citizenship dimension makes it possible to assess whether existing infrastructure is, in fact, being converted into socially relevant outcomes, moving beyond an approach centered solely on infrastructure stock or network extension. Furthermore, incorporating this dimension into INFRA-BR expands the index's capacity to identify territorial inequalities, guide investment prioritization and bring infrastructure measurement closer to an impact-oriented logic, in line with international frameworks that advocate outcome-based rather than input-based assessments.

The components assessed in this dimension are:

- Health;
- Education;
- Housing and Urban Infrastructure;
- Social Assistance; and
- Culture, Leisure and Sport.





INFRA-BR Dimension Social Well-being and Citizenship	Ranking	Federative Unit
70.50	1	PR
68.76	2	SP
68.26	3	RS
65.18	4	GO
65.00	5	DF
63.44	6	SC
62.52	7	RJ
62.00	8	MS
61.56	9	MG
60.07	10	CE
60.04	11	MT
58.97	12	ES
56.22	13	RO
55.27	14	RN
52.21	15	PE
51.71	16	PB
50.18	17	SE
47.82	18	AL
47.41	19	TO
46.12	20	BA
42.70	21	PI
31.11	22	MA
27.29	23	PA
21.97	24	RR
20.86	25	AC
20.54	26	AP
20.22	27	AM

Table 6: Results of the Social Well-being and Citizenship dimension of INFRA-BR for each Federative Unit.

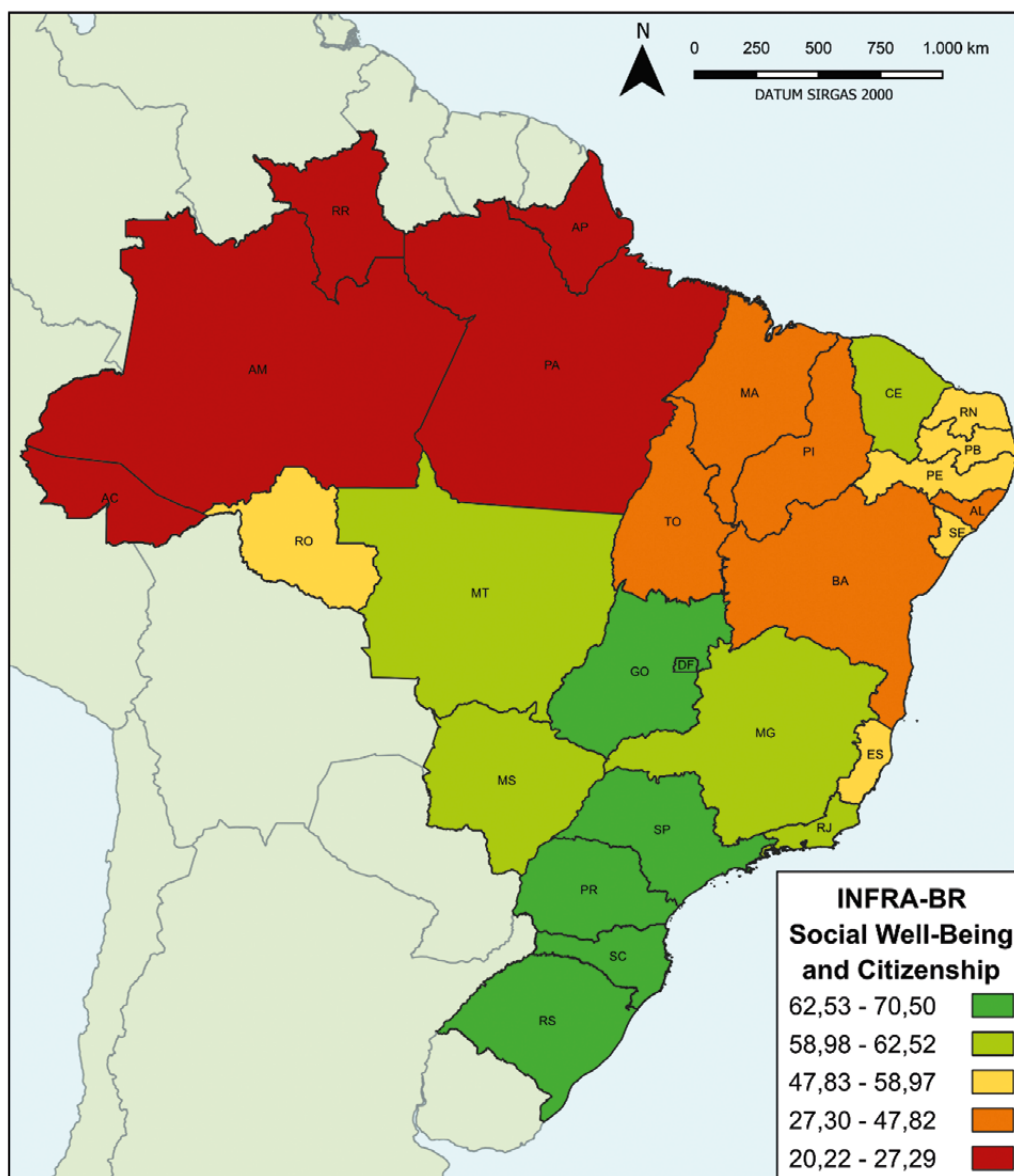


Figure 5: Map of the Social Well-being and Citizenship dimension of INFRA-BR for the 27 Federative Units.

The national average score of this dimension is 57.89 points, which would occupy position 13 in the national ranking. In the Social Well-being and Citizenship dimension, the index highlights how social infrastructure – encompassing health equipment, education, social assistance, culture and leisure – is distributed unevenly across the national territory, with PR, SP, RS, GO, DF and SC in the top positions. In contrast, Federative Units with higher social vulnerability indices and less structured public policies, such as AM, AP, AC, RR and PA, show the lowest scores, translating into



more limited access to fundamental services for life quality. These findings reinforce that investments in infrastructure must be articulated with strategies for reducing social inequalities and strengthening networks of protection and citizenship rights across the entire territory.



3.5 Environment and Resilience

The **Environment and Resilience** dimension is based on the understanding that the impacts of climate change manifest systemically, with direct effects on the hydrological cycle, ecosystems, infrastructure and the well-being of populations, requiring integrated approaches for their measurement. The dimension transversally encompasses the relationship between vegetation cover, hydrological functioning and risk reduction, recognizing that preserved ecosystems and nature-based solutions play a central role in mitigating floods, droughts and urban heat islands, as well as contributing to environmental quality and local climate regulation.

The components assessed in this dimension are:

- Climate Adaptation and Resilience; and
- Vegetation Cover and Conservation.



INFRA-BR Dimension Environment and Resilience	Ranking	Federative Unit
87.08	1	DF
72.36	2	RJ
68.85	3	MG
64.06	4	SP
62.75	5	MT
61.57	6	SC
61.56	7	RS
59.14	8	PR
56.66	9	AP
55.47	10	AM
53.32	11	GO
50.50	12	RO
49.96	13	TO
48.68	14	RR
47.59	15	AC
47.16	16	ES
46.50	17	MA
42.74	18	MS
40.94	19	PA
40.45	20	SE
37.32	21	AL
34.24	22	BA
31.87	23	PB
29.00	24	PE
24.75	25	CE
24.25	26	PI
22.91	27	RN

Table 7: Results of the Environment and Resilience dimension of INFRA-BR for each Federative Unit.



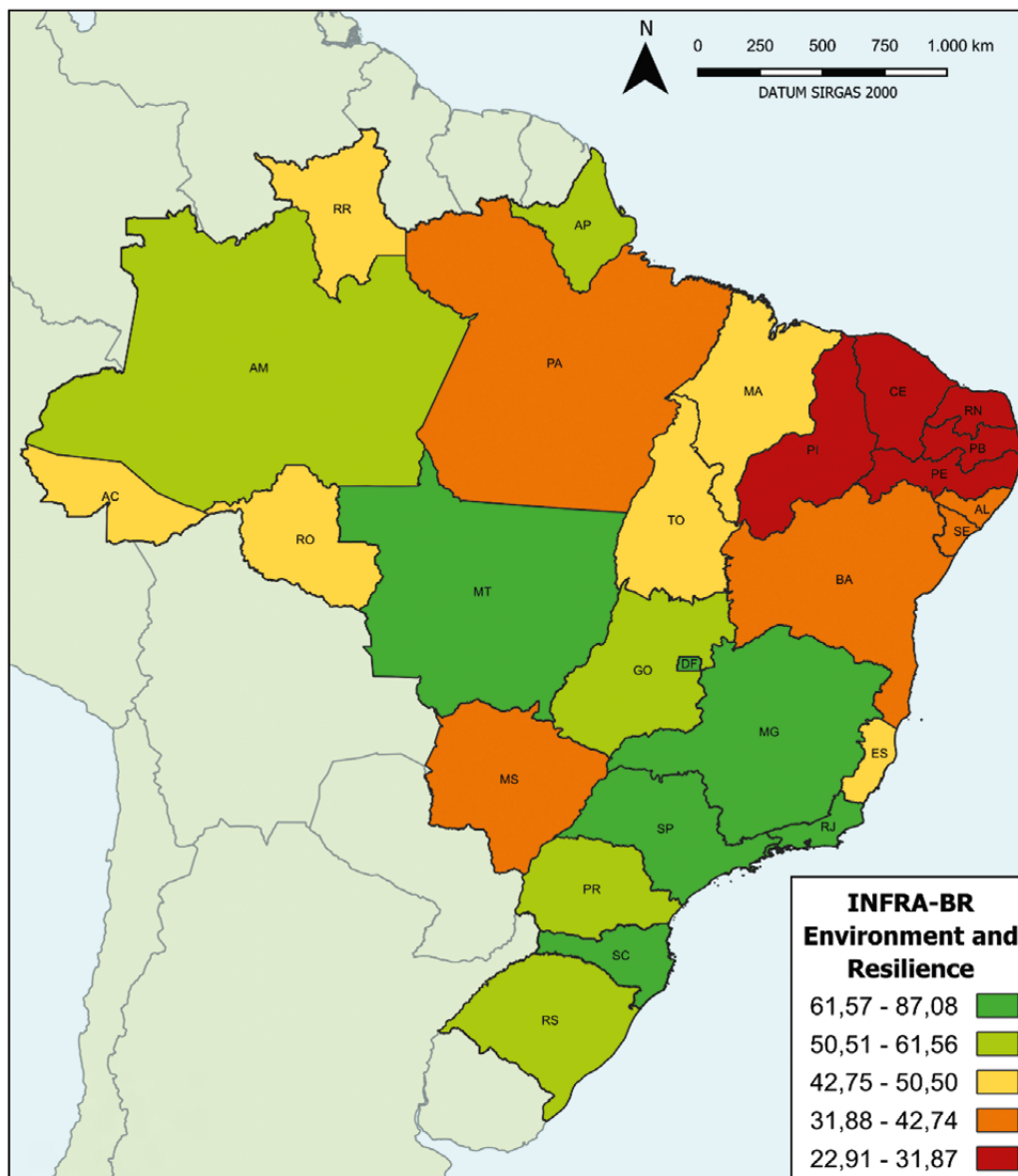


Figure 6: Map of the Environment and Resilience dimension of INFRA-BR for the 27 Federative Units.

The national average score of this dimension is 54.02 points, which would occupy position 11 in the national ranking. The results of the Environment and Resilience dimension show that the capacity of states to reconcile economic development, environmental conservation and risk management is still highly heterogeneous, with DF, RJ, MG, SP, MT and SC occupying the top positions of the ranking. States with intense pressures on natural resources, disorderly occupation and greater vulnerability to extreme events, such as RN, PI, CE, PE and PB, appear in the lowest

positions, highlighting additional challenges in reconciling conservation and development. The observed differences reinforce the importance of integrating infrastructure policies with climate adaptation strategies, biome protection, recovery of degraded areas and the strengthening of disaster prevention and response systems, increasing the resilience of populations and public assets.



3.6 Basic Sanitation

In the Basic Sanitation dimension, which complements the Water dimension, the primary focus falls on the services of collection and treatment of solid waste and sewage, recognizing that urban water security depends on both the supply of water and the quality of water returned to the environment after use. One of the main concerns in this field is the high proportion of generated sewage that does not receive adequate treatment, which compromises the quality of water bodies, reduces water availability downstream and imposes additional costs on catchment and treatment systems, in addition to favoring contamination processes by microorganisms.

The components assessed in this dimension are:

- Solid Waste; and
- Sewage.



INFRA-BR Dimension Basic Sanitation	Ranking	Federative Unit
80.19	1	DF
76.29	2	PR
73.85	3	SC
67.05	4	RS
64.34	5	MG
64.06	6	ES
60.29	7	SP
59.18	8	RJ
56.56	9	MT
55.57	10	GO
54.42	11	MS
53.12	12	RO
52.22	13	SE
51.19	14	CE
50.13	15	TO
46.79	16	AP
46.70	17	AL
45.28	18	AM
44.22	19	RR
43.96	20	PB
42.97	21	RN
42.96	22	PI
40.72	23	PA
39.74	24	BA
31.02	25	PE
18.85	26	MA
11.28	27	AC

Table 8: Results of the Basic Sanitation dimension of INFRA-BR for each Federative Unit.



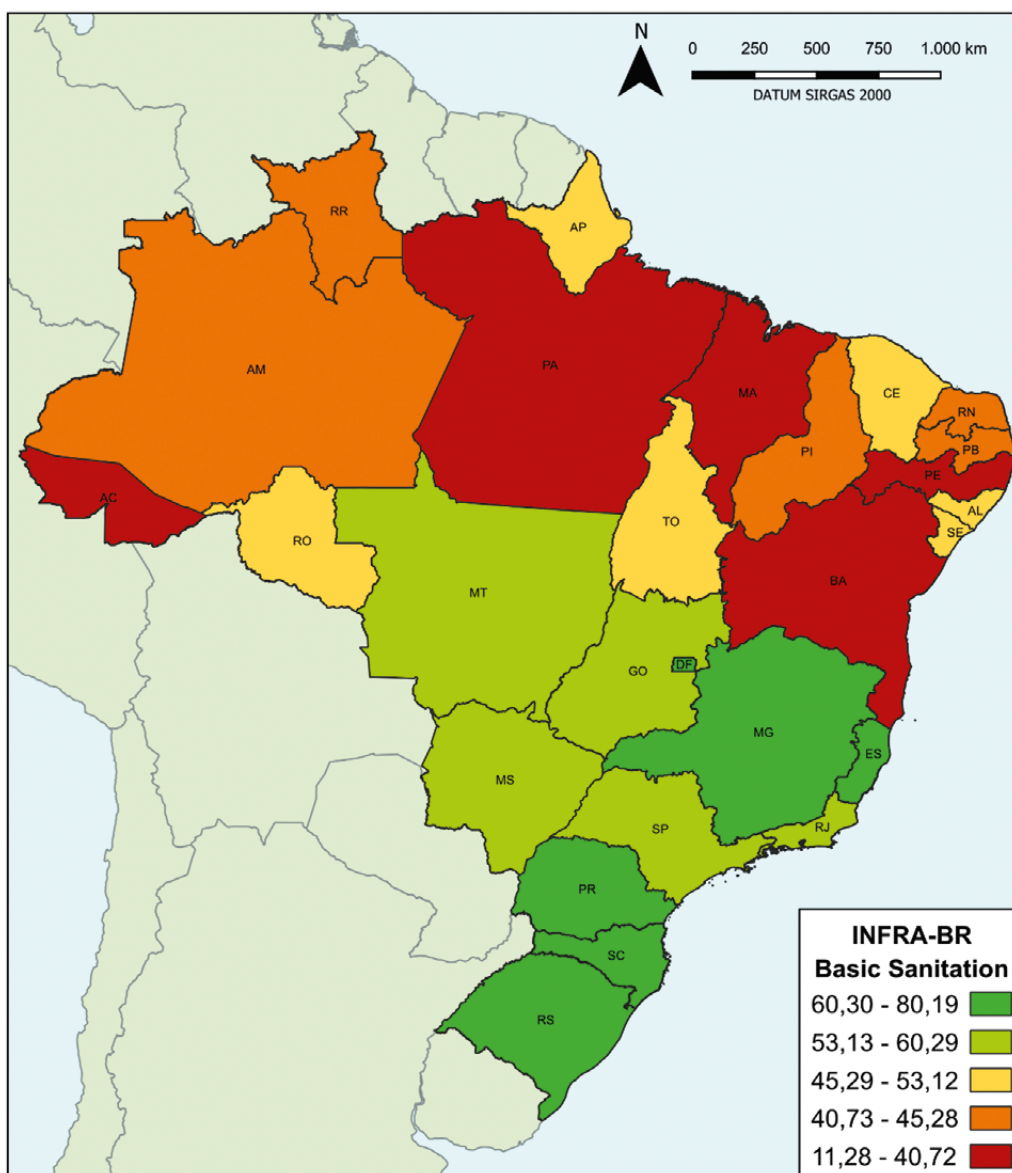


Figure 7: Map of the Basic Sanitation dimension of INFRA-BR for the 27 Federative Units.

The national average of this dimension is 55.20 points, which would occupy position 11 in the national ranking. In the Basic Sanitation dimension, INFRA-BR highlights one of the most critical axes of Brazilian infrastructure, with DF, PR, SC, RS, MG and ES occupying the top positions. In contrast, Federative Units with larger sanitation deficits, such as AC, MA, PE, BA and PA, show the lowest scores, indicating insufficient coverage of sewage collection networks, limited effluent treatment and inadequate waste disposal practices. These asymmetries reinforce that



sanitation must occupy a central position in investment priorities, since its deficits exacerbate social vulnerabilities, increase health costs and undermine the effectiveness of other infrastructure and environmental policies.

FINAL CONSIDERATIONS



INFRA-BR 2026 confirms that Brazilian infrastructure is marked by strong territorial asymmetries but also reveals trajectories of progress in different regions and sectors. Federative Units with greater investment capacity, more consolidated urban networks and more robust institutional arrangements – especially in the Southeast, South and Central-West – concentrate the best results across the six dimensions assessed, while the North and Northeast regions stand out for the combination of more acute structural challenges. The performance gap between the Federative Units that lead the ranking and those that occupy the lowest positions illustrates the magnitude of infrastructural inequalities, with direct implications for economic competitiveness, territorial cohesion and the guarantee of basic rights.

By detailing each dimension, the index shows that these evolve heterogeneously, requiring responses suited to their specificities. There are states that excel in Sanitation but still show weaknesses in Mobility; others advance in Environment and Resilience but face deficits in Social Well-being and Citizenship. In the North and parts of the Northeast, the lower results in Mobility, Water and Sanitation reveal the persistence of basic infrastructure voids, compounded by territorial conditioning factors such as extensive population voids, fragmented transport networks and greater exposure to extreme climatic events. In parallel, the relatively high performance of some Amazonian Federative Units in Environment and Resilience indicates that biome conservation and risk management can constitute strategic assets for a sustainable development agenda.

The report also highlights that Brazil has a broad but still incomplete informational base for systematically monitoring infrastructure quality. The construction of INFRA-BR required the use of administrative records, sector-specific databases and proxies, as well as series harmonization

procedures, with particularly sensitive gaps in topics such as road bridges, electrification of public transport fleets and climate risk monitoring.

Given this context, INFRA-BR should be understood as a starting point for diagnoses and debates, and not as a definitive portrait of each sector. Its most powerful use occurs when combined with longitudinal analyses – comparing the performance of each Federative Unit over time – and with multidimensional readings that recognize that deficits in sanitation, for example, have repercussions on health, environment and social well-being, and that mobility bottlenecks restrain access to services and opportunities. The sound use of INFRA-BR by managers, oversight bodies, professional councils and civil society can, at the same time, support investment decisions more aligned with evidence and stimulate the consolidation of new indicators, expanding the country's transparency and planning capacity.

In this sense, the index fulfils a dual function: it synthesizes the current state of infrastructure across the 27 Federative Units and makes explicit the improvement agenda that the country needs to address, both in terms of works and services and in terms of information production. Addressing the bottlenecks identified – especially in regions with the greatest deficits – requires combining physical investments with institutional strengthening, effective regulation, systematic asset maintenance and policies aimed at reducing territorial inequalities. By anchoring this effort in clear and periodically updatable metrics, INFRA-BR positions itself as a central tool for guiding a more responsible, equitable, resilient and sustainable development-aligned infrastructure.



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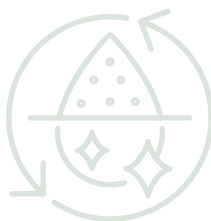
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ANNEX 1

DATA SOURCES AND VARIABLE DETAILS

INFRA-BR 2026 uses the most recent data available for each indicator up to the database closing date (January 2026). Therefore, annually updated variables (e.g., CNES, IBGE/SIDRA) refer to 2024 or 2025, while bases with longer periodicity (e.g., MUNIC, MapBiomias) may have earlier years as the last public update. Temporal diversity reflects the heterogeneity of collection and publication cycles of official sources and is addressed methodologically through imputation and statistical standardization as described in the Methodology section.

DIMENSION	COMPONENT	INDICATOR	YEAR	SOURCE	UNIT	DESCRIPTION / CALCULATION
ENERGY AND CONNECTIVITY	TELECOMMUNICATIONS	Broadband connection quality	2026	Anatel	Fixed broadband accesses per 100 households	Density of in-service accesses associated with the provision of Multimedia Communication Service – SCM (fixed broadband), represented by the number of in-service accesses per 100 households, normalized by Anatel.
		Telecommunications capacity and coverage	2025	Anatel	% of households	Percentage of households with mobile cellular network service for telephony or internet access in the household.
		Mobile signal coverage (4G and 5G)	2024	Anatel	% of residents	Estimated mobile coverage across the following variables: technologies, frequencies, station locations, antenna heights and directions, transmitter power, buildings and topography, normalized by Anatel.
	ENERGY GENERATION	Total energy generation	2024	CEE	MWmed / (BRL/inhab.)	Considers the total energy generation reported by the National Electric System Operator (ONS) and divides it by the GDP per capita of the Federative Unit.
		Granted power capacity	2025	Aneel	kW/inhab.	Sums the granted power in kilowatts of all plants filtered for the reference year and divides the result by the total population of the Federative Unit.
		Diversity of the energetic matrix	2026	Aneel	Absolute value (number of categories)	Groups the original generation sources into categories of hydro, solar, wind and thermal, and counts the number of distinct sources present in each Federative Unit.
	ENERGY TRANSMISSION	Transmission line extension	2025	Aneel	% of area	Total extension of active transmission lines in the Federative Unit divided by the total area of the FU.
		Transformation capacity	2026	Aneel	MVA/inhab.	Transformation capacity in substations per capita per Federative Unit (filters power transformers, sums the nominal active power in megavolt-amperes of the latest available load, and divides the result by the total population of the Federative Unit).
	ENERGY DISTRIBUTION	Average Equivalent Interruption Frequency (FEC)	2026	Aneel	Absolute value (number of interruptions per consumer unit)	Average number of power outages per consumer in each Federative Unit during the reference year.
		Average Equivalent Interruption Duration (DEC)	2024	Aneel	Hours	Average time consumers were without electricity per Federative Unit in the most recent year.
		Average energy consumption per capita	2025	EPE/IBGE	MWh/inhab.	Total number of distributed generation consumer units divided by the number of households in the Federative Unit.

DIMENSION	COMPONENT	INDICATOR	YEAR	SOURCE	UNIT	DESCRIPTION / CALCULATION
MOBILITY	INTRA-MUNICIPAL TRANSIT	Bus service quality	2024	MUNIC	Index (1–100)	Composite index that multiplies the number of municipalities with bus fleet availability by service quality, considering regulated buses, the existence of adapted fleets and accessible boarding infrastructure. The result is divided by the total number of municipalities in the Federative Unit.
		Cycling infrastructure	2024	MUNIC	% of municipalities	Simple average of the percentage of municipalities with the presence of cycle lanes/cycle paths/cycle routes in the Federative Unit divided by the total number of municipalities in the Federative Unit.
		Presence of high-capacity transit	2024	MUNIC	% of municipalities	Simple average of the percentage of municipalities with the presence of metro in the Federative Unit divided by the total number of municipalities in the Federative Unit, combined with the percentage of municipalities with the presence of rail in the Federative Unit divided by the total number of municipalities in the Federative Unit.
		Modal diversity index	2024	MUNIC	% of municipalities	Simple average of the percentage of Federative Unit municipalities that have specific modes (boat, metro, motorcycle taxi, train, van, plane and ride-hailing apps) relative to the total number of municipalities in the Federative Unit.
	PORTS	Port throughput volume	2025	ANTAQ	Tonnes / BRL	Total volume of cargo handled at Federative Unit ports (in tonnes) divided by the nominal GDP of the Federative Unit.
		Average handling productivity	2025	ANTAQ	Tonnes / hour	Total weight of cargo handled (tonnes) divided by the total effective operating hours of all vessels that berthed at the port facilities of the Federative Unit.
		Average waiting time for berthing	2025	ANTAQ	Hours	Arithmetic mean of the time elapsed between the vessel's arrival in the anchorage zone and the effective berthing at the quay, expressed in hours, for all port operations recorded in the Federative Unit.
	CARGO FLOW	Volume transported by cabotage	2026	ANTAQ	Tonnes	Volume of cargo transported by cabotage linked to the state divided by the total absolute amount of cargo in the Federative Unit.
		Revenue from logistics activities (waterway, air, rail and road)	2025	RAIS	% share in Federative Unit GDP	Ratio between the sum of total earnings of formal employment ties classified under CNAE section 52 (Storage and transport auxiliary activities) and the nominal GDP of the Federative Unit in the same period.
		Rail tonne-kilometre (TKU)	2025	CNT	Tonnes / km	Refers to the sum of the net load (in tonnes) multiplied by the rail network distance (in kilometers).
		Inland waterway transport volume	2025	ANTAQ	Facilities / tonnes	Ratio between the count of inland port facilities and the inland navigation tonnage per Federative Unit.

DIMENSION	COMPONENT	INDICATOR	YEAR	SOURCE	UNIT	DESCRIPTION / CALCULATION
MOBILITY	HIGHWAYS	Road accident mortality rate	2024	DATASUS	% of population	Total number of deaths caused by road traffic accidents in the reference year, divided by the total population of the Federative Unit.
		Condition and Maintenance Index (CMI) of federal highways	2025	DNIT	Index (0 - 100)	Percentage of km classified as "good" in the Condition and Maintenance Index (CMI < 30) relative to the total kilometers of federal highways in the Federative Unit, using the last month of the reference year as reference.
		State highway quality	2025	ANTT - Pistas Marginais	% of highways	Percentage of state highways with pavement classified as good or excellent per Federative Unit, divided by the total extension of the road network analyzed in the road panel.
		Road geometry quality	2025	CNT - Transporte Rodoviário	% of highways	Percentage of the road network with geometry classified as good or excellent in the CNT survey for the reference year, divided by the total extension of the Federative Unit road network.
	AIRPORTS	Installed air traffic capacity	2025	ANAC	Take-offs / inhabitants	Total take-offs originating in the state, divided by the resident population of the Federative Unit.
		Airport network connectivity	2025	ANAC	Aerodromes / GDP per capita	Number of distinct destination aerodromes connected from the Federative Unit, divided by the GDP per capita of the Federative Unit.
		Aerodrome density	2025	ANAC	Aerodromes / km ²	Number of aerodromes divided by the area of the Federative Unit.
WATER	WATER QUALITY	Microbiological compliance	2025	SISÁGUA	% of samples	Percentage of samples with the presence of total coliforms (> 0 or positive textual terms) per Federative Unit.
		Residual chlorine compliance	2025	SISÁGUA	% of samples	Percentage of samples with free residual chlorine outside the regulatory range (0,2 - 0,5 mg / L) per Federative Unit.
	WATER DISTRIBUTION	Access to the public water network	2024	IBGE/ SIDRA	% of households	Proportion of households connected to the public water supply network relative to the total number of households surveyed in the Federative Unit.
		Rural distribution rate	2024	IBGE/ SIDRA	% of households	Percentage of rural households and residents connected to the general water distribution network.
		Urban distribution rate	2024	IBGE/ SIDRA	% of households	Percentage of urban households and residents connected to the general water distribution network.
		Water distribution efficiency	2024	SNIS	% distribution losses	Percentage of water not lost in distribution per Federative Unit.

DIMENSION	COMPONENT	INDICATOR	YEAR	SOURCE	UNIT	DESCRIPTION / CALCULATION
SOCIAL WELL-BEING AND CITIZENSHIP	HEALTH	Proportion of healthcare facilities per population	2024	DATASUS - CNES	Healthcare facilities / inhabitants	Counts distinct healthcare facilities (hospitals, health posts, clinics) and divide the total by the resident population of the Federative Unit.
		Total of equipment doctors	2025	DATASUS - CNES	Number of equipment items	Total number of healthcare equipment items in each Federative Unit (telehealth, audiology, imaging diagnosis, infrastructure, dentistry, life maintenance, graphic methods, optical methods and other equipment), regardless of their usage status, using the most recent records from the CNES equipment table.
		Hospital beds per population	2025	DATASUS - CNES	Number of beds / inhabitants	Sums the total number of available beds (all specialties) and divides the result by the total resident population of the Federative Unit.
	EDUCATION	Sanitary accessibility for Persons with Disabilities (PwD) in schools	2024	INEP – School Census	% of schools	Proportion of schools that have bathrooms adapted for Persons with Disabilities (PwD) relative to the total number of schools in the state education network mapped in the School Census.
		Drinking water supply coverage in schools	2024	INEP – School Census	% of schools	Percentage of schools that have drinking water supply relative to the total number of schools mapped by the School Census in the Federative Unit.
		Percentage of schools with broadband internet access	2024	INEP – School Census	% of schools	Percentage of schools that have broadband internet access relative to the total number of schools in each Federative Unit in the reference year.
		Science teaching infrastructure	2024	INEP – School Census	% of schools	Percentage of schools that have science laboratories relative to the total number of schools registered in the School Census for each Federative Unit.
		Density of computing equipment	2024	INEP – School Census	Computers / students	Number of computers available for student use (desktops and laptops) divided by the total number of students enrolled in the Federative Unit's schools.
	HOUSING & URBAN INFRASTRUCTURE	Housing with paved surroundings	2025	IBGE/ SIDRA	% of households	Proportion of permanent private households in the Federative Unit that have paving (asphalt, cobblestone or concrete) on the immediately adjacent public road.
		Availability of private bathrooms	2024	IBGE/ SIDRA	% of households	Percentage of Federative Unit households that have at least one bathroom with sanitary and bathing facilities for the exclusive use of residents.
		Constructive adequacy of housing	2024	IBGE/ SIDRA	% of households	Proportion of Federative Unit households built with materials considered adequate for walls, roof and floor (indicator "housing with inadequate walls, roof and floor" calculated in reverse).

DIMENSION	COMPONENT	INDICATOR	YEAR	SOURCE	UNIT	DESCRIPTION / CALCULATION
SOCIAL WELL-BEING AND CITIZENSHIP	HOUSING & URBAN INFRASTRUCTURE	Housing deficit	2023	FPJ e IBGE	% of households	Measures the number of inadequate households in Brazil, calculated based on four components: precarious housing (rudimentary or improvised), co-habitation (cohabiting families in the same household), excessive rental burden (families spending more than 30% of income on rent) and housing in slums or risk areas.
	SOCIAL ASSISTANCE	Average score in the Index of Social Assistance Reference Centers Development (IDCRAS)	2024	CadSUAS / MDS	Index (0 - 15)	Simple arithmetic average of the IDCRAS values (Development Index of Social Assistance Reference Centers – which assesses the development of units across three dimensions: physical structure, human resources and services/benefits) reported for the municipalities of each Federative Unit.
		Average score in the Index of Specialized Social Assistance Reference Centers Development (IDCREAS)	2024	CadSUAS / MDS	Index (0 - 15)	Simple arithmetic average of the IDCREAS values (Development Index of Specialized Social Assistance Reference Centers – which assesses the development of units across three dimensions: physical structure, human resources and services/benefits) reported for the municipalities of each Federative Unit.
	CULTURE, LEISURE AND SPORT	Squares and parks in urban areas	2022	MapBiomias	m²/inhab.	Sums the total area of squares and parks in urban areas of the Federative Unit and divides the resulting value by the resident population of the Federative Unit.
		Proportion of schools with library or reading room	2024	INEP - Censo Escolar	% of schools	Percentage of schools that provide a library or reading room for students in relation to the total number of schools registered in each Federative Unit.
		Proportion of schools with sports court	2024	INEP - Censo Escolar	% of schools	Percentage of schools that have sports courts in relation to the total number of educational establishments in the Federative Unit.
		Proporção de museus no estado por população	2025	Painel Analítico – MuseusBr	% de museus	Counts the total number of museums registered per Federative Unit and normalizes the absolute amount by the total resident population of the Federative Unit.
	CLIMATE ADAPTATION AND RESILIENCE	Proportion of municipalities with stormwater drainage and management planning	2024	SINISA	% of municipalities	Percentage of Federative Unit municipalities with more than 20,000 inhabitants that have a Stormwater Drainage and Management component in the Basic Sanitation Plan (municipal and/or regional), pursuant to Federal Law no. 11,445/2007, divided by the total number of municipalities with more than 20,000 inhabitants.
ENVIRONMENT AND RESILIENCE		Adaptive capacity index	2017	Adapta Brasil	Index (0 - 100)	Biodiversity adaptive capacity index per Federative Unit – measures the resilience of biomes to climate change, analyzing the integrity of vegetation cover, legal protection (conservation units) and the effectiveness of state actions in risk mitigation.

DIMENSION	COMPONENT	INDICATOR	YEAR	SOURCE	UNIT	DESCRIPTION / CALCULATION
ENVIRONMENT AND RESILIENCE	CLIMATE ADAPTATION AND RESILIENCE	Dam safety	2024	ANA / S2iD	Index (1 - 3)	Filters dams catalogued by ANA according to low, medium and high-risk categories, and calculates the arithmetic mean of these values to determine the average risk level in each Federative Unit.
		Reduction of gross greenhouse gas emissions (CO ₂ e)	2024	SEEG	tonnes CO ₂ e / km ²	Annual variation of CO ₂ e emissions proportional to the area of the Federative Unit - consolidates the Federative Unit 's CO ₂ e emission data and calculates the net reduction in tonnes through the difference between consecutive years, normalized by the total area of the Federative Unit.
		Water bodies and wetlands coverage	2024	MapBiomias	% of area	Coverage of water bodies and wetlands proportional to the state area (aggregates surfaces mapped as "water", "marine environments", "wetlands", "mangroves" and "flooded forests").
	VEGETATION COVER AND CONSERVATION	Urban green areas	2024	MapBiomias	% of urban area	Sum of surfaces mapped as "vegetation" within the urban perimeter and division of the total value by the urban geographic area of the Federative Unit.
		Total degradation rate	2024	MapBiomias	% per year	Total sum of suppression (primary and secondary) for the current and previous year, determining the ratio between these values to identify whether there has been an increase or decrease in the percentage rate of deforestation in the Federative Unit.
		Degree of urban impermeability	2024	MapBiomias	% of urban area	Amount of area without vegetation cover (grey patch) divided by the total urban area of the Federative Unit.
BASIC SANITATION	SOLID WASTE	Adequacy of final waste disposal	2024	SINISA	% of waste	Percentage of collected urban solid waste in the municipality that does not have inadequate final disposal – i.e., sent to open dumps, dumping sites or controlled landfills.
		Solid waste collection coverage	2024	IBGE/ SIDRA	% of households	Coverage of the total population with household solid waste collection (indicator IRS0001).
		Recyclable material recovery rate	2024	SINISA	% of waste	Recovery of dry recyclable and organic materials relative to the total amount of collected waste (indicator IRS3010).
	SEWAGE	Coverage of collected sewage treatment	2024	SINISA	% of treated sewage	Percentage of collected sewage volume and the treated volume per Federative Unit.
		Total sewage service coverage	2024	SINISA	% of population	Percentage of the total population served by a sewage collection network or adequate individual solutions per Federative Unit.
		Sewage system adequacy	2024	IBGE/ SIDRA	% of households	Proportion of sewage disposal types that are not considered "other types" (alternative or precarious) per Federative Unit.



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