

# E-GOVERNMENT DEVELOPMENT:

Local Online Service  
Index In Brazilian Municipalities

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# 1. Introduction

**D**igital transformation is an ongoing phenomenon that has caused changes in social, environmental, political, economic and organizational practices through the widespread use of information and communication technologies (ICT). ICTs also play an increasingly important role in interactions between governments and people. Technologies can be used to increase the supply and quality of service delivery, improve the efficiency of public institutions, promote government transparency and accountability, facilitate electronic interaction and participation, and mitigate corruption (UNDESA, 2020).

Local governments play a leading role in providing public and urban services and in sustainable development. This role has been recognized by the New Urban Agenda (NUA). NUA presents a shared vision for a better and more sustainable future – where all people have equal rights and access to the benefits and opportunities that cities can offer (UN, 2017). The 2030 Sustainable Development Goals (SDGs) also express in goal 11 – Sustainable Cities and Communities, the need to make cities and human settlements inclusive, safe, resilient and sustainable (UN, 2015). Numerous discussions emerge about the role of ICT in achieving these goals, especially concerning their potential for public administration at both the national and subnational levels to transform cities towards a socially, economically and environmentally sustainable future.

Brazil is politically and administratively organized as a federation, where municipalities have constitutional obligations to implement public policies and deliver services to citizens, leading to exceptional attention to local governments. The country has a high degree of urbanization; about 85% of the Brazilian population lives in urban areas, which pressures local governments to offer quality public services to all people.

Concerned about the importance of understanding the use of digital technology at the local level, since 2018, the United Nations (UN) has been conducting biannual research on the ‘Local Online Service Index - LOSI’ through its Department of Economic and Social Affairs (UNDESA) and the Division for Public Institutions and Digital Government. The LOSI measures and describes the extent to which local governments have developed their e-government capabilities. Additionally, pilot projects have been developed in collaboration with local institutions. The pilot project was conducted in Brazil in 2021, and the main objectives of the research were:

- Understand the online presence of Brazilian municipalities;
- Evaluate the city halls’ online portals in terms of technological resources, provision of content and services and mechanisms for local participation and engagement;
- Describe the online public services and telehealth to face the COVID-19 pandemic made available by city halls.

According to the findings, most of the 52 evaluated municipalities strongly adhere to the LOSI indicators in the four dimensions: technology, content provision, service provision and mechanism for participation and engagement. Specifically, 13% were classified as having a very high level, 79% were ranked as high, and 8% were considered middle level. Notably, none of the municipalities fell into the low level. While the municipalities demonstrated compliance in service provision, content provision, and adherence to technology standards, they exhibited less adherence to participation and engagement indicators. It is worth mentioning that the e-government initiatives in Brazil date back to the 1990s, and the municipalities examined in this study are among the largest in terms of population and contribute significantly to the national GDP. Given these factors, it is unsurprising that the measurements indicate high levels of e-government development.

This executive summary presents the highlighted results. Section 1 presents data collection, treatment and analysis methods adapted to the Brazilian context. In section 2, a brief description of the political-administrative organization in Brazil is carried out, and sociodemographic information on the municipalities of the research is provided. Then, in section 3, the LOSI results are presented for each dimension, including stratified analysis by capitals cities and the federal district, non-capitals cities, macro-regions and population size. The final section highlights opportunities, challenges and public policy recommendations for developing digital government in municipalities.

## 2. Methodology

This study was applied in evaluating 53 Brazilian municipalities. The data were collected between June and September 2021. Each municipal portal was evaluated by two researchers, with individual and comparative evaluations of their responses, whose divergences were jointly reviewed and addressed under the supervision of the research coordination—additionally, was carried out a second review of responses to 26 indicators in November 2021. The aim was to gauge indicators that had few negative or positive responses. The consolidated database was analyzed using descriptive and clustering statistical analyses.

The LOSI is calculated based on the normalized value of 87 indicators. Each indicator is assigned a 1 (yes) or 0 (no) value. According to the total number of indicators identified, the municipality is assigned to one of four levels or groups ranging from very high to low. For the Brazilian pilot, 13 indicators of the service provision dimension were excluded because they were not attributable to the municipalities. Therefore, the Index was calculated based on 74 indicators (Table 1).

**Table 1.** Assigned values of the Local Online Service Index

Maturity level	Number of indicators	Index range
Very High	56 -74	0.75 -1.00
High	37 -55	0.50 -0.74
Middle	19 -36	0.25 -0.49
Low	0 -18	0.00 -0.24

Source: LOSI.br study

Furthermore, 41 indicators were used to evaluate the portals about online public services and telehealth availability to face the COVID-19 pandemic. This data has been analyzed using descriptive statistics and clustering and is not part of the LOSI. The results are published in a specific article<sup>1</sup>.

An electronic questionnaire was sent to public officials responsible for the information technology area of the city halls under investigation. The objective was to collect qualitative data on the e-government strategies of the municipality, availability of online services, user satisfaction, performance on social media, measures in the COVID-19 pandemic and smart cities. Answers were obtained from 21 municipalities and analyzed qualitatively. The results are available only in the full report in Portuguese.

<sup>1</sup> The provision of online municipal information and services in the COVID-19 pandemic. Available in: <https://cetic.br/en/publicacao/pesquisa-sobre-o-uso-das-tecnologias-de-informacao-e-comunicacao-no-setor-publico-brasileiro-tic-governo-eletronico-2021/>

Regarding the LOSI adaptations to the Brazilian municipalities context, it was necessary because of the country's political-administrative organization as a federation that enables e-government policies to be decentralized by local governments. Some public services are federal, state and municipal governments' shared responsibility; others are outsourced to private agents. Thirteen indicators related to providing services online were excluded, including accessing and modifying company data, as a valid Business License Number (CNPJ) would be required. The issue of driving licenses and vehicle registration are the responsibility of state governments. The Federal Police handle residence applications in Brazil. Requests for death, marriage and birth certificates and land title registrations are services state governments outsource to private agents. Finally, in Brazil, citizens are not obligated to report a change of address to the government. After the data collection, it was found that indicators related to online payments for water and energy services should also be excluded, as in most cases, these are not the responsibility of municipalities. The indicator dealing with declarations to the municipal police online was also excluded (Figure 1).

**Figure 1.** List of LOSI GLOBAL indicators excluded from the LOSI Brazil study

- Business data accessibility
- Business data updating
- Online declarations to police
- Online driver's license
- Online residency
- Online birth certificate
- Online death certificate
- Online marriage certificate
- Address change notification
- Online land title registration
- Online vehicle registration
- Water payment
- Electricity/gas payment

Source: LOSI.br study

# 3. The LOSI in Brazilian Municipalities

This chapter presents the results of the LOSI of Brazilian municipalities evaluated. The chapter begins with a description of Brazil's political-administrative organization. Afterwards, the set of investigated municipalities and some sociodemographic characteristics are presented. Then, the results are presented in the four evaluated dimensions: technology, provision of content, provision of services and participation and engagement—also, the levels of maturity and the implementation of LOSI indicators in the municipalities. Finally, stratified analyses are presented by type of municipality, macro-region, population size and cluster analysis results.

Brazil is a federation comprised of federative units, including 26 states, the Federal District, and 5,570 municipalities. Geographically, the country is divided into five macro-regions. The states represent largest units of political-administrative organization and are governed by a governor. The state capitals are typically the most populous municipalities within their respective states and serve as the seat of state government due to their economic and political significance. The municipalities, led by mayors, have their own urbanized areas, known as cities or towns, where most residents reside (IBGE 2023). This political-administrative structure aims to enhance the management of the country's economy and public services at the local level. Therefore, each administrative sphere has its own set of specific and sometimes shared responsibilities outlined in the 1988 Constitution. These competencies are reflected in e-government policies, as each municipality has the autonomy to develop and execute independent actions.



**Figure 2.** The Brazilian political-administrative organization map  
Source: IBGE, 2021a

The study included all the state capitals and municipalities with a population equal to or greater than 500,000 inhabitants, with 53 municipalities (Table 2). This sample represents around a third of the Brazilian population (IBGE, 2021) and all the regions and states in Brazil. The municipality of Uberlândia was excluded from the survey, as in the period during which data collection was concentrated, the local government portal was unstable, and a complete collection of the indicators was impossible.

**Table 2. Sociodemographic information of the evaluated municipalities**

Macro-region	State	Municipality	Portal	Estimated population (2021)	GDP per capita (BRL\$) (2019)	HDI (2010)
Central-West	Distrito Federal	Brasília*	df.gov.br	3,094,325	90,742	0.824
	Goiás	Aparecida de Goiânia	aparecida.go.gov.br	601,844	24,855	0.718
		Goiânia*	goiania.go.gov.br	1,555,626	34,901	0.799
	Mato Grosso	Cuiabá*	cuiaba.mt.gov.br	623,614	40,199	0.785
	Mato Grosso do Sul	Campo Grande*	campogrande.ms.gov.br	916,001	33,744	0.784
Northeast	Alagoas	Maceió*	maceio.al.gov.br	1,031,597	22,976	0.721
	Bahia	Feira de Santana	feiradesantana.ba.gov.br	624,107	24,229	0.712
		Salvador*	www.salvador.ba.gov.br	2,900,319	22,213	0.759
	Ceará	Fortaleza*	fortaleza.ce.gov.br	2,703,391	25,254	0.754
	Maranhão	São Luís*	saoluis.ma.gov.br	1,115,932	29,135	0.768
	Paraíba	João Pessoa*	joaopessoa.pb.gov.br	825,796	25,768	0.763
	Pernambuco	Jaboatão dos Guararapes	jaboatao.pe.gov.br	711,330	19,750	0.717
		Recife*	recife.pe.gov.br	1,661,017	33,232	0.772
	Piauí	Teresina*	teresina.pi.gov.br	871,126	25,458	0.751
	Rio Grande do Norte	Natal*	natal.rn.gov.br	896,708	28,113	0.763
Sergipe	Aracaju*	aracaju.se.gov.br	672,614	26,688	0.770	
North	Acre	Rio Branco*	riobranco.ac.gov.br	419,452	22,448	0.727
	Amapá	Macapá*	macapa.ap.gov.br	522,357	22,718	0.733
	Amazonas	Manaus*	manaus.am.gov.br	2,255,903	38,880	0.737
	Pará	Ananindeua	ananindeua.pa.gov.br	540,410	15,389	0.718
		Belém*	belem.pa.gov.br	1,506,420	21,708	0.746
	Rondônia	Porto Velho*	portovelho.ro.gov.br	548,952	33,825	0.736
	Roraima	Boa Vista*	boavista.rr.gov.br	436,591	26,482	0.752
Tocantins	Palmas*	palmas.to.gov.br	313,349	34,933	0.788	

Continue...

**Table 2. Continuation**

Macro-region	State	Municipality	Portal	Estimated population (2021)	GDP per capita (BRL\$) (2019)	HDI (2010)
Southeast	Espírito Santo	Serra	serra.es.gov.br	536,765	49,980	0.739
		Vila Velha	vilavelha.es.gov.br	508,655	26,040	0.800
		Vitória*	vitória.es.gov.br	369,534	59,693	0.845
	Minas Gerais	Belo Horizonte*	prefeitura.pbh.gov.br	2,530,701	38,695	0.810
		Contagem	contagem.mg.gov.br	673,849	45,855	0.756
		Juiz de Fora	pjf.mg.gov.br	577,532	32,864	0.778
		Uberlândia	uberlandia.mg.gov.br	706,597	54,430	0.789
	Rio de Janeiro	Belford Roxo	prefeituradebelfordroxo.rj.gov.br	515,239	15,785	0.684
		Campos dos Goytacazes	campos.rj.gov.br	514,643	57,329	0.716
		Duque de Caxias	duquedecaxias.rj.gov.br	929,449	49,295	0.711
		Niterói	niteroi.rj.gov.br	516,981	90,643	0.837
		Nova Iguaçu	novaiguacu.rj.gov.br	825,388	21,220	0.713
		Rio de Janeiro*	rio.rj.gov.br	6,775,561	52,833	0.799
		São Gonçalo	saogoncalo.rj.gov.br	1,098,357	16,916	0.739
	São Paulo	Campinas	campinas.sp.gov.br	1,223,237	54,710	0.805
		Guarulhos	guarulhos.sp.gov.br	1,404,694	47,249	0.763
		Osasco	osasco.sp.gov.br	701,428	117,298	0.776
		Ribeirão Preto	ribeiraopreto.sp.gov.br	720,116	50,270	0.800
		Santo André	santoandre.sp.gov.br	723,889	42,209	0.815
		São Bernardo do Campo	saobernardo.sp.gov.br	849,874	60,871	0.805
São José dos Campos		sjc.sp.gov.br	737,310	60,194	0.807	
São Paulo*		capital.sp.gov.br	12,396,372	62,341	0.805	
Sorocaba		sorocaba.sp.gov.br	695,328	54,878	0.798	
South	Paraná	Curitiba*	curitiba.pr.gov.br	1,963,726	49,706	0.823
		Londrina	londrina.pr.gov.br	580,870	37,912	0.778
	Rio Grande do Sul	Caxias do Sul	caxias.rs.gov.br	523,716	52,873	0.782
		Porto Alegre*	portoalegre.rs.gov.br	1,492,530	55,555	0.805
	Santa Catarina	Florianópolis*	pmf.sc.gov.br	516,524	43,842	0.847
Joinville		joinville.sc.gov.br	604,708	58,476	0.809	

\*State capital

Source: IBGE, 2021, 2019; PNDU 2010

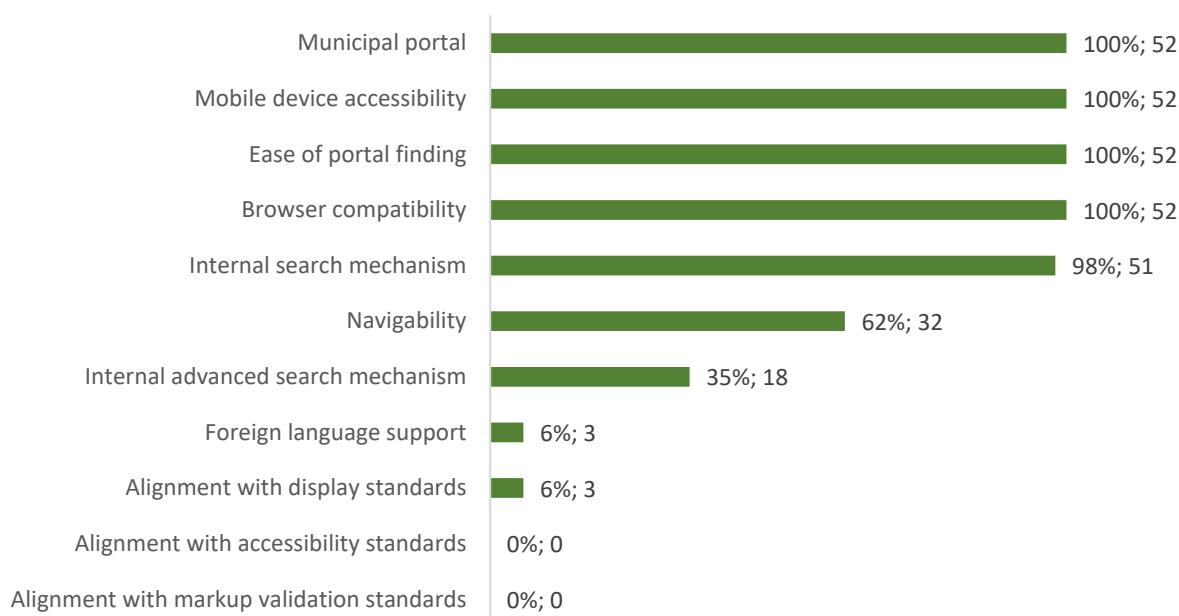
### 3.1 Results of the LOSI in the Brazilian municipalities

A high level of adherence of the 52 evaluated municipalities to the LOSI indicators was observed. Thirteen per cent (13%) are ranked at the very high level, 79% at the high and 8% were classified at the middle level. No municipality was at the low level. Regarding dimensions, municipalities are less adherent to participation and engagement indicators but demonstrate high compliance in service provision, content provision and adherence to technology standards.

#### 3.1.1 Technology

The findings from the study, as presented in Figure 3, indicate that all 52 municipalities investigated possess a portal. These portals are designed to be mobile-responsive, easily discoverable through popular search engines such as Google, Bing, and Yahoo, and compatible with commonly used web browsers in Brazil such as Chrome, Safari, and Opera. Moreover, out of the 51 municipalities with a search engine on their portal, 18 of them have advanced search options available. Additionally, 32 of the portals include a site map. However, it is worth noting that only three municipalities have made their government portal available in a foreign language.

Regarding compatibility with international technology standards, only three portals support Cascading Style Sheets (CSS), a simple mechanism for adding style (e.g., fonts, colours, spacing) to web documents. No portal showed 100% compliance with the web content accessibility guidelines (WCAG 2.0). The WCAG 2.0 include several recommendations for making content more accessible. Following these guidelines makes content accessible to more people with disabilities, including blindness and low vision, deafness and low hearing, learning disabilities, cognitive limitations, movement limitations, speech impairment, photosensitivity, and combinations of these characteristics. Additionally, no portal was found to comply with markup validity defined by the World Wide Web Consortium (W3C).



**Figure 3.** Results for the indicators of the technology dimension

Source: LOSI.br study

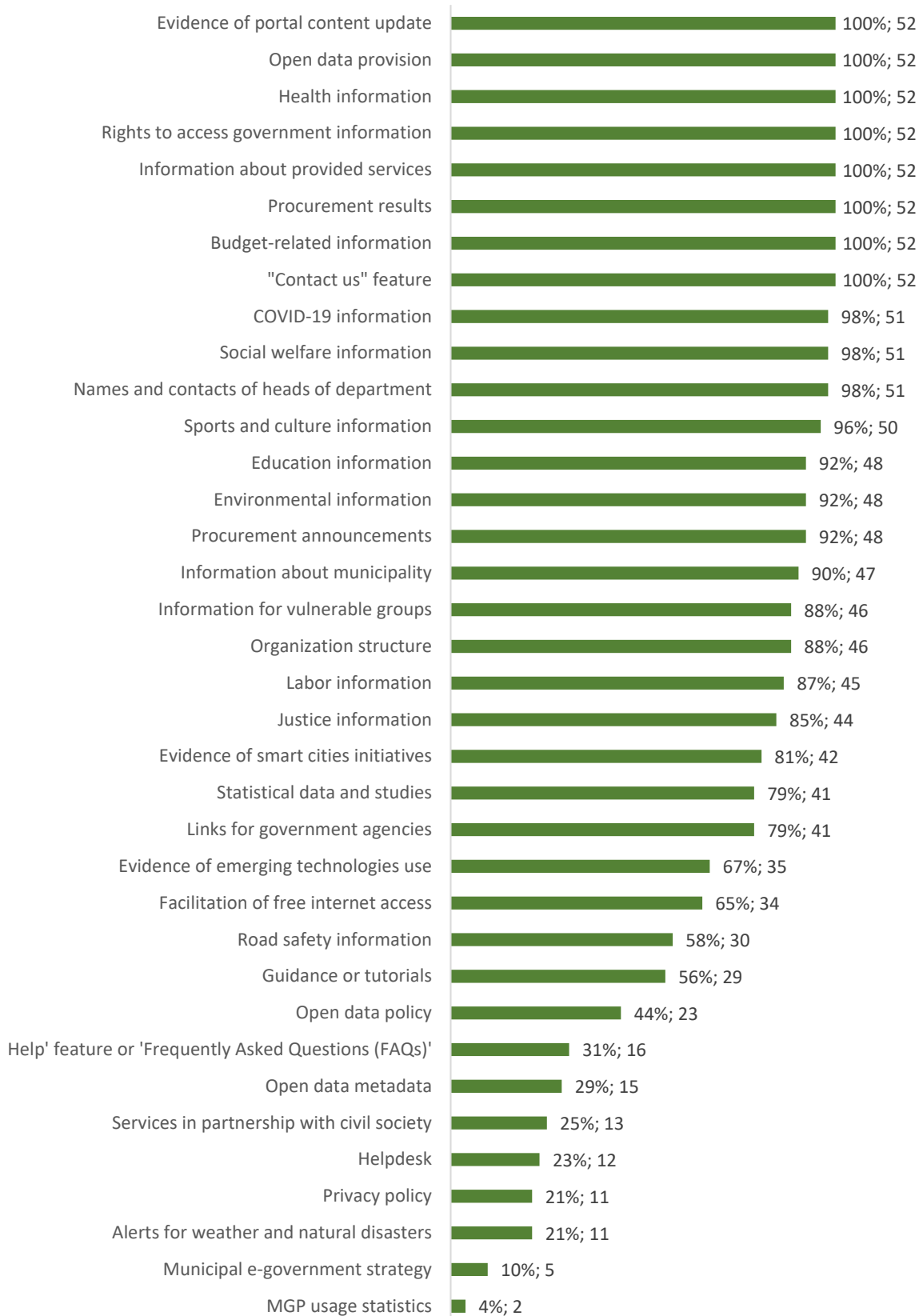
### 3.1.2 Content Provision

Regarding content provision (Figure 4), the portals of all 52 municipalities are constantly updated with information and news. Data are available in an open format, with information on procurement results, government purchases and budget information on transparent portals. Public health information is also available, mainly on the Covid-19 pandemic, information on the right of access to public data, through the LAI, and information on the public services provided by the municipality. Every portal also has a Contact Us feature by email, telephone or form.

Through 51 portals, it is possible to find information on names, positions and ways of contacting public managers and social welfare actions offered to the population. Almost all the municipal governments (51) have made available a specific page with information on the Covid-19 pandemic. On 50 portals, there is information about leisure, sport and culture. On 48 portals are procurement announcements and information on environmental and education issues. On 47 portals, there is general information about the municipality, such as history, demography, geographical region, economy and tourism. On 46 portals, finding content for vulnerable groups, such as the homeless, is possible. Furthermore, 46 portals present the administrative structure of the municipal government.

The portals of 29 municipalities offer guidance or tutorials to citizens to help them understand and use online services, and 30 provide information or online platforms on road safety. There is evidence of free access to online government services through kiosks, community centres, post offices, libraries, public spaces or free Wi-Fi on 34 portals. Regarding emerging technologies (blockchain, artificial intelligence, Internet of Things), 35 portals provide some indication of their use (or intended use) by the municipality. Forty-one (41) websites provide links to other state or federal government agencies and statistical data or studies. On 42 portals, there is some indication of smart city initiatives or efforts in the municipality. 44 and 45 portals provide information on justice and labour issues, respectively.

The least evident contents on the municipal portals, under 50%, have to do with the existence of the following features: an open government data policy (23); a Help feature or Frequently Asked Questions (FAQs) section (16); provision of metadata relevant to the related open data (15); evidence of providing online services in partnership with civil society (13); a helpdesk phone number to assist people who face difficulties in accessing services online or through any digital channel (12); a portal privacy policy or statement (11); and information on how people can receive updates or subscribe to notifications to stay up-to-date on alerts about the weather or natural disasters (11). Only five portals showed a municipal e-government strategy. Web usage statistics, such as new visits, total pageviews, average time on site, etc., were available on only two portals.



**Figure 4. Results for the indicators of the content provision dimension**

Source: LOSI.br study

### 3.1.3 Services Provision

The results for online service provision (Figure 5) show a high degree of digitization in the 52 municipalities in question. On 100% of the portals, there are services for businesses to declare tax. Some authentication is also required to access online services. On 46 portals, the existence of e-procurement for public purchases is evidenced. This service is sometimes offered in collaboration with public banks and other state and federal government agencies. On 45 portals, there is evidence that the city hall provides mobile phone apps, and on 42 portals, there is information about the recycling and reuse of waste.

Users can apply for business licenses (41), apply for jobs or to take civil service tests (40), apply for building permits (33), pay fines or fees for government services (28), and apply for environmental permits (27) online on the main portal or a service portal provided by the municipal government. It is also possible to find information on public transport (40). An email was sent to all municipal governments at the address shown on the main portal or on the Contact Us form, usually available in the municipality’s ombudsman area. After three business days, the message was answered by 26 municipal governments, with the responses being helpful in 25 cases. It was also evident that when registering on the main or service portal, people can access their data registered on 39 portals. On 35 of them, it is possible to modify the registered data. The online service that is least available on the portals of the municipalities under study is for complaints about any form of discrimination (16).



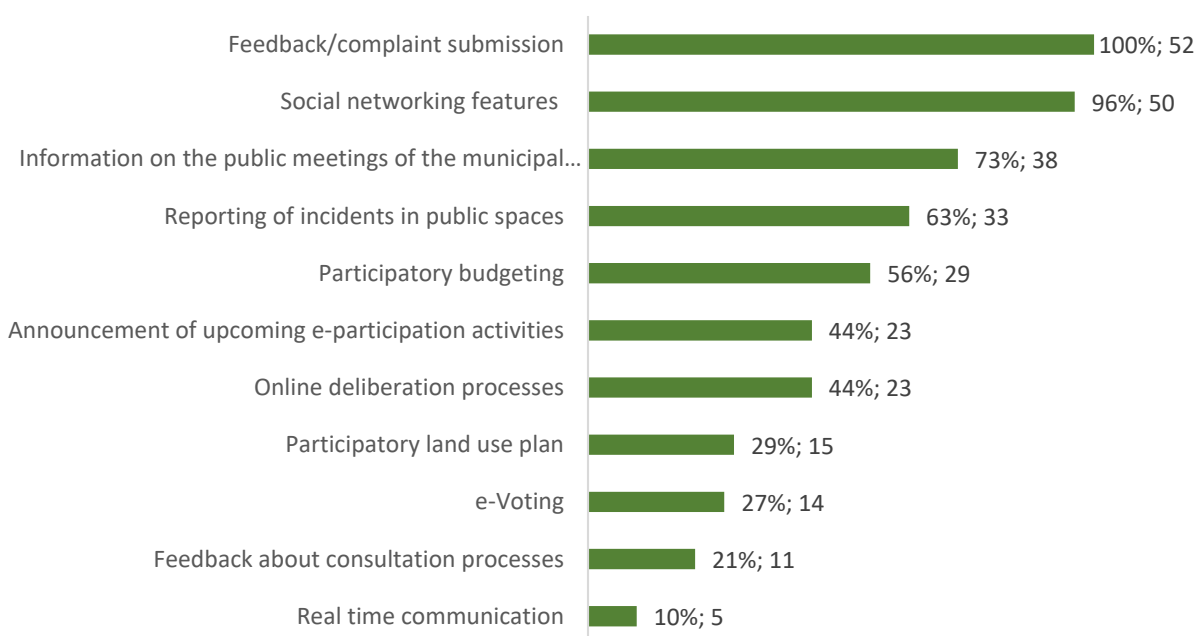
**Figure 5. Results for the indicators of the service provision dimension**

Source: LOSI.br study

### 3.1.4 Participation and engagement

The results on participation and engagement (Figure 6) are lower concerning the other dimensions. The most evident form of interaction with the municipal government is to send complaints, doubts and feedback online through municipal ombudsman channels (52). The presence of municipal governments on social media is also evident, with 50 portals directly linking to Facebook, Twitter or Instagram, among other media. On 38 portals, there is information about public meetings, such as municipal councils. On 33 portals, reporting occurrences in public areas or spaces is possible.

Users can participate online in public budget decisions with 29 municipal governments. On 23 portals, there is information about future e-participation activities; on 23 portals, online tools are available to collect public opinion and provide information on political deliberation processes. On 15 portals, it is possible to participate in territorial organization review processes, such as formulating the Master Plan. On 14 portals, it was shown that the local government has already offered or offers an electronic voting service to support its decision-making. On 11 portals, information was found on the results of electronic consultations. Only five provide a citizen support function through live chat.

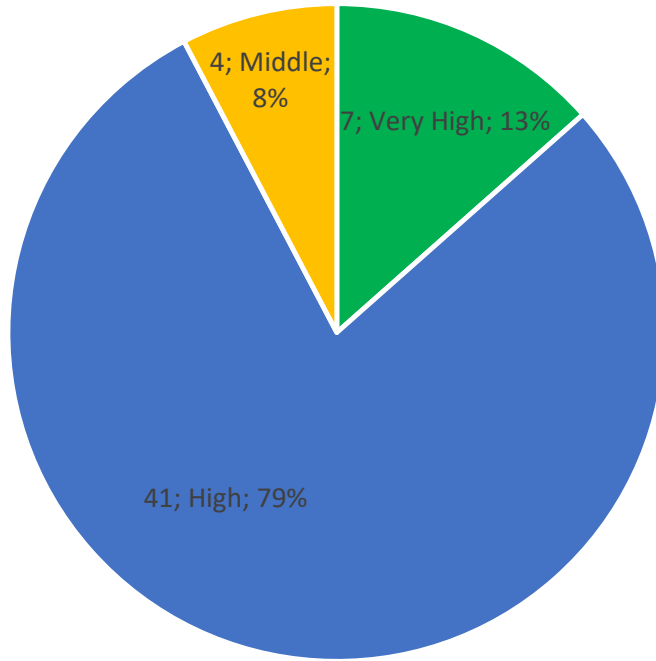


**Figure 6.** Results for the indicators of the participation and engagement dimension

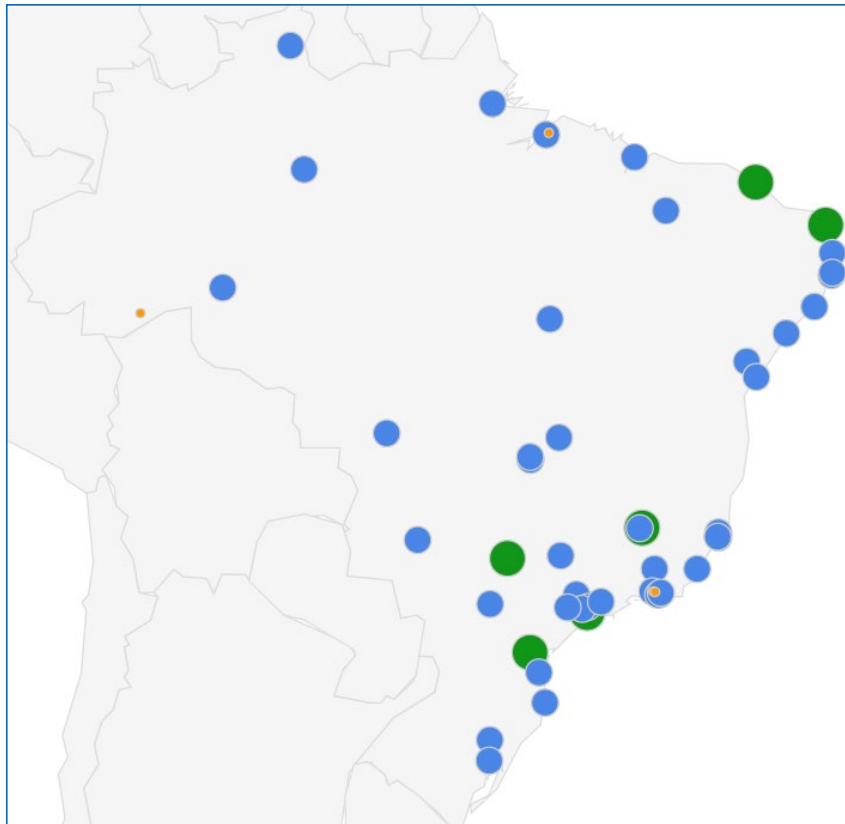
Source: LOSI.br study

### 3.1.5 LOSI maturity levels

The LOSI evaluation methodology categorises municipalities into four levels: very high, high, intermediate and low. Seven municipalities (13%) are at the very high level, 41 (79%) are at the high level, and four (8%) are at the intermediate level (Figure 7). No evaluated municipality was at the low level. The map (Figure 8) represents the geographical distribution of municipalities based on LOSI levels.



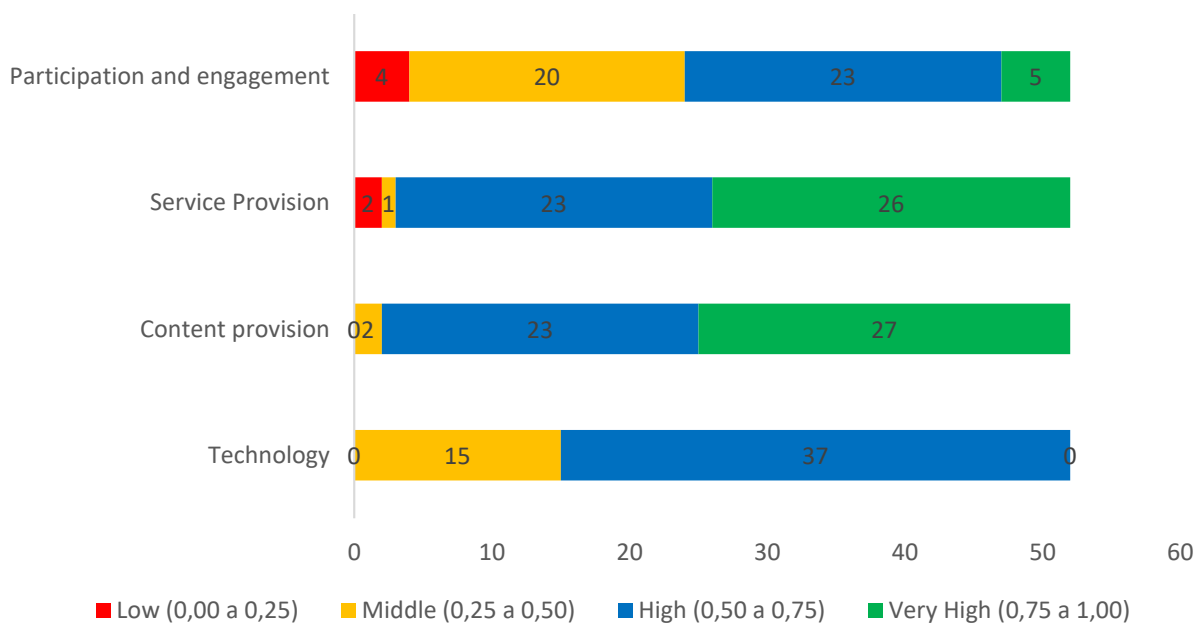
**Figure 7.** Distribution of evaluated municipalities by their LOSI maturity levels.  
Source: LOSI.br study



**Figure 8.** Geographic distribution of municipalities by LOSI maturity level

### 3.1.6 Implementation of LOSI indicators on municipal portals

The results (Figure 9) showed that five municipalities implemented 75% to 100% of the 11 participation and engagement indicators that were measured, and 23 (56%) implemented between 50% and 75% of the indicators. Meanwhile, 24 municipalities (46%) implemented less than 50%. High adherence to the LOSI indicators is most evident regarding content provision. Twenty-seven evaluated portals implemented 75% to 100% of the 36 content provision indicators, while 23 portals adhered to 50% to 75% of the indicators of this dimension. Meanwhile, the portals of only two municipalities implemented less than 50% of the indicators. In the technology dimension, with 11 indicators, 37 (71%) of the portals are concentrated at the high level (50% to 75%). No portal reached the very high level. In the service provision dimension, 26 municipalities achieved between 75% and 100% of the 16 indicators, and 23 complied with 50% to 75%. In comparison, only three evaluated municipalities had a compliance rate of under 50% with the indicators in this dimension.

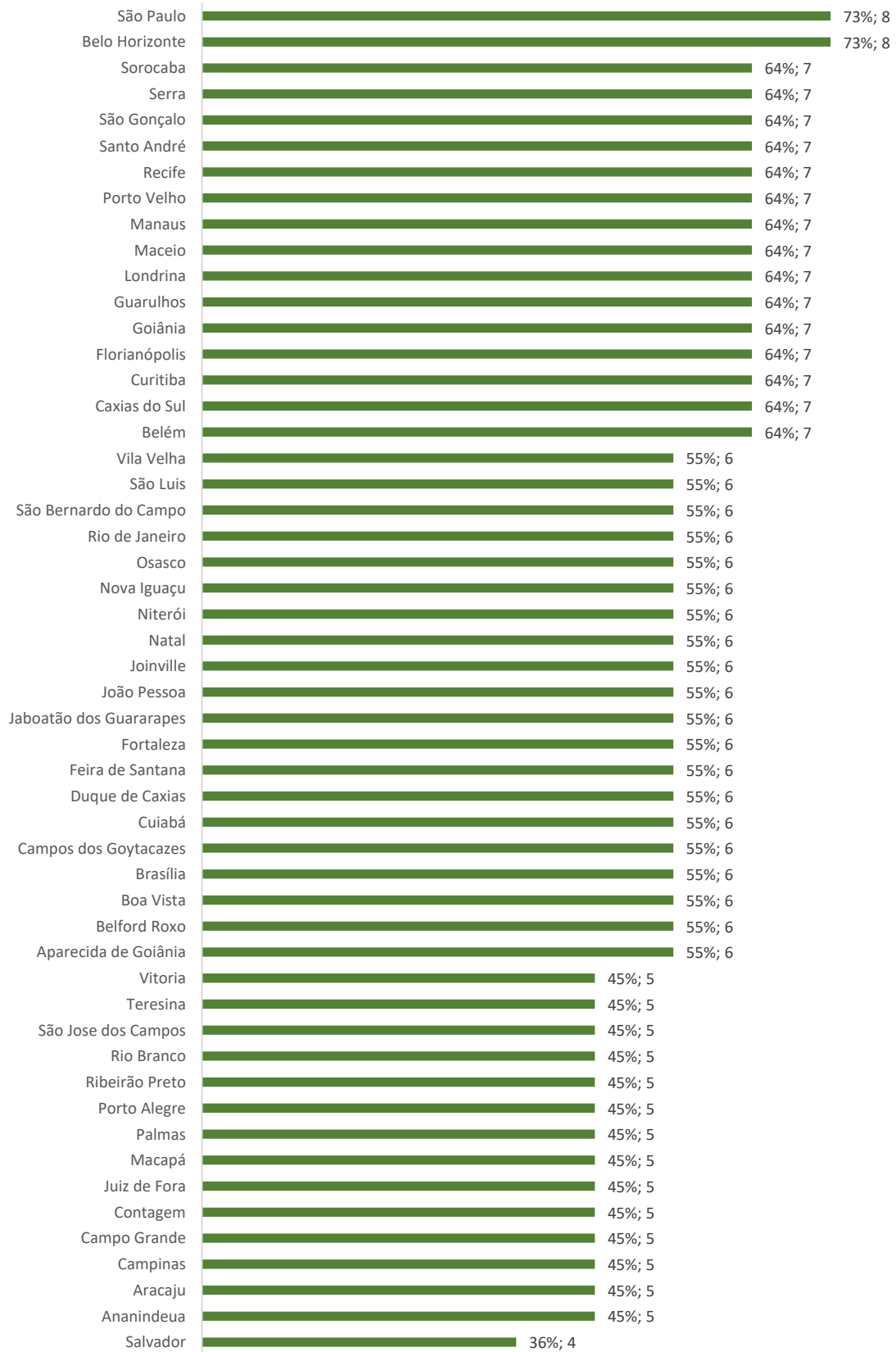


**Figure 9. Number of cities and indicators per dimension**

Source: LOSI.br study

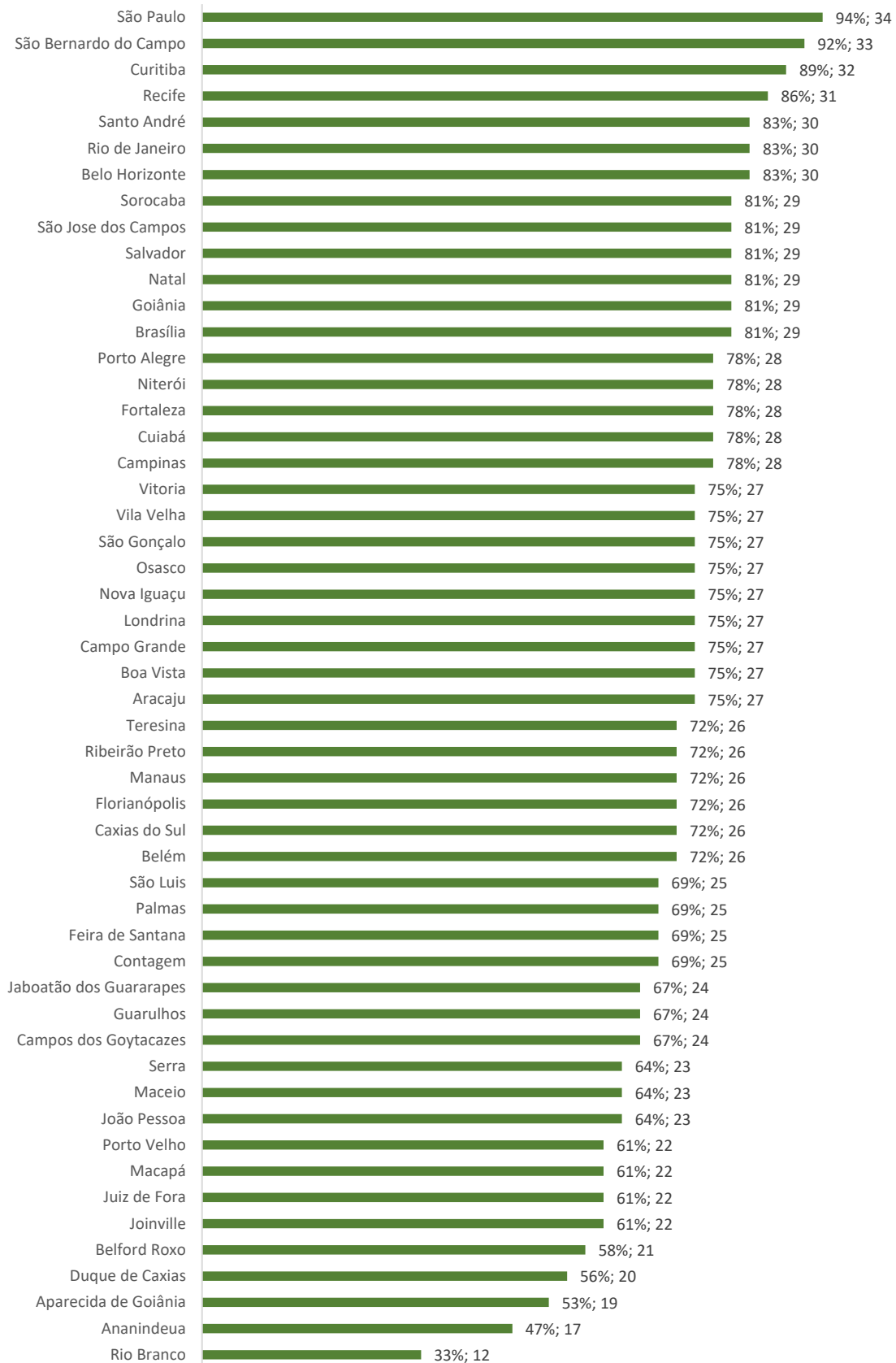
The visual examination of the municipalities by dimension (Figure 10) highlights São Paulo/SP and Belo Horizonte/MG in the first place, with 73% adherence to the technology dimension indicators. There is a large group of municipalities in second place with 64% of achievement of indicators in this dimension. Regarding content provision (Figure 11), São Paulo/SP appears again in the lead with 94%, followed by São Bernardo do Campo/SP (92%) and Curitiba (89%).

Curitiba/PR is first in the services provision dimension (Figure 12), with 100% of the indicators marked. After Curitiba, São Paulo/SP, São Bernardo do Campo/SP, Campo Grande/MS and Boa Vista/RR follow, with 94% of indicators achieved. In the participation and engagement dimension (Figure 13), São Paulo/SP and Fortaleza/CE appear with 91% of the indicators. Then São Bernardo do Campo/SP, Niterói/RJ and Curitiba/PR, with 82% of the indicators of this dimension marked.



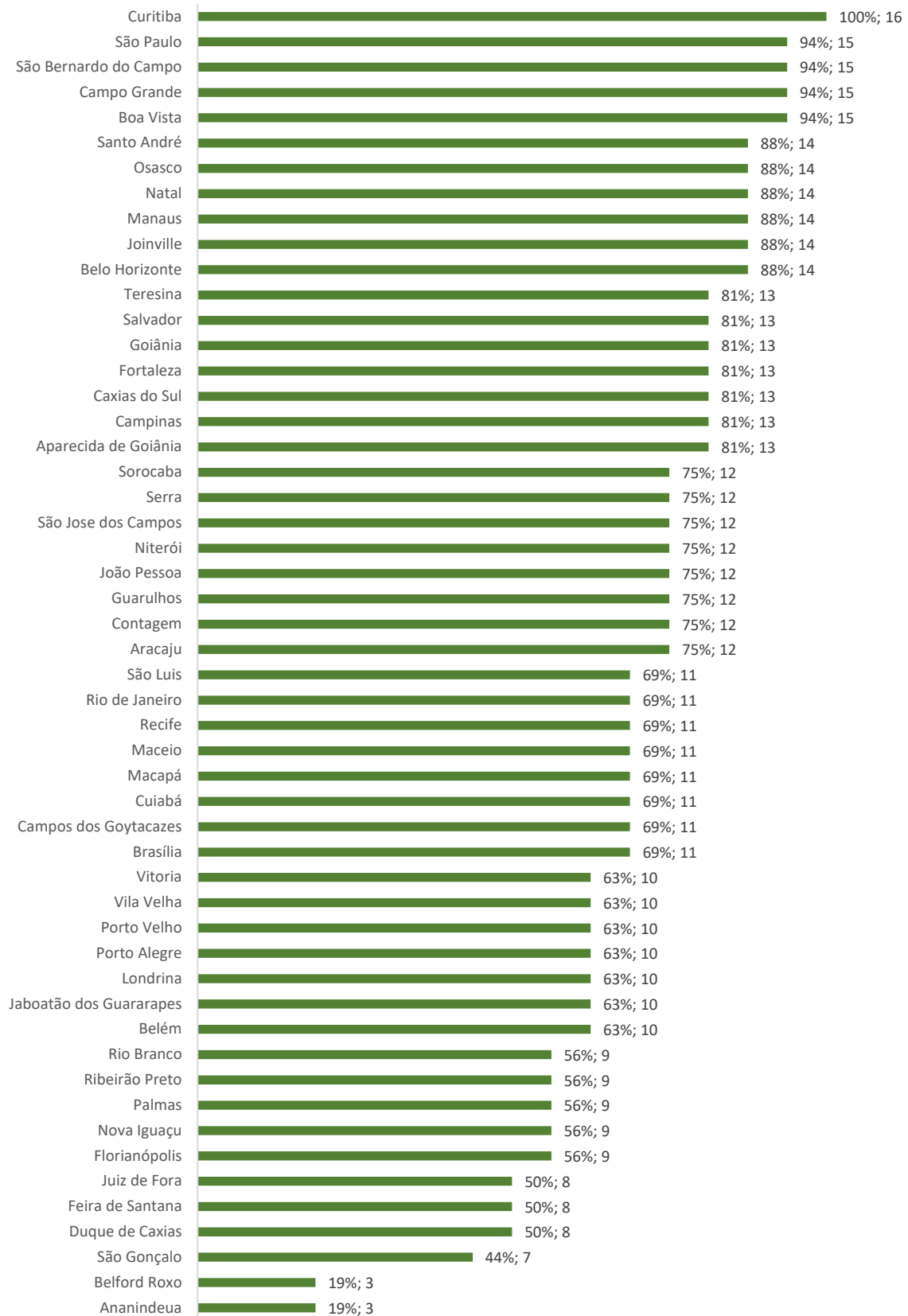
**Figure 10.** Adherence of municipalities to technology indicators

Source: LOSI.br study



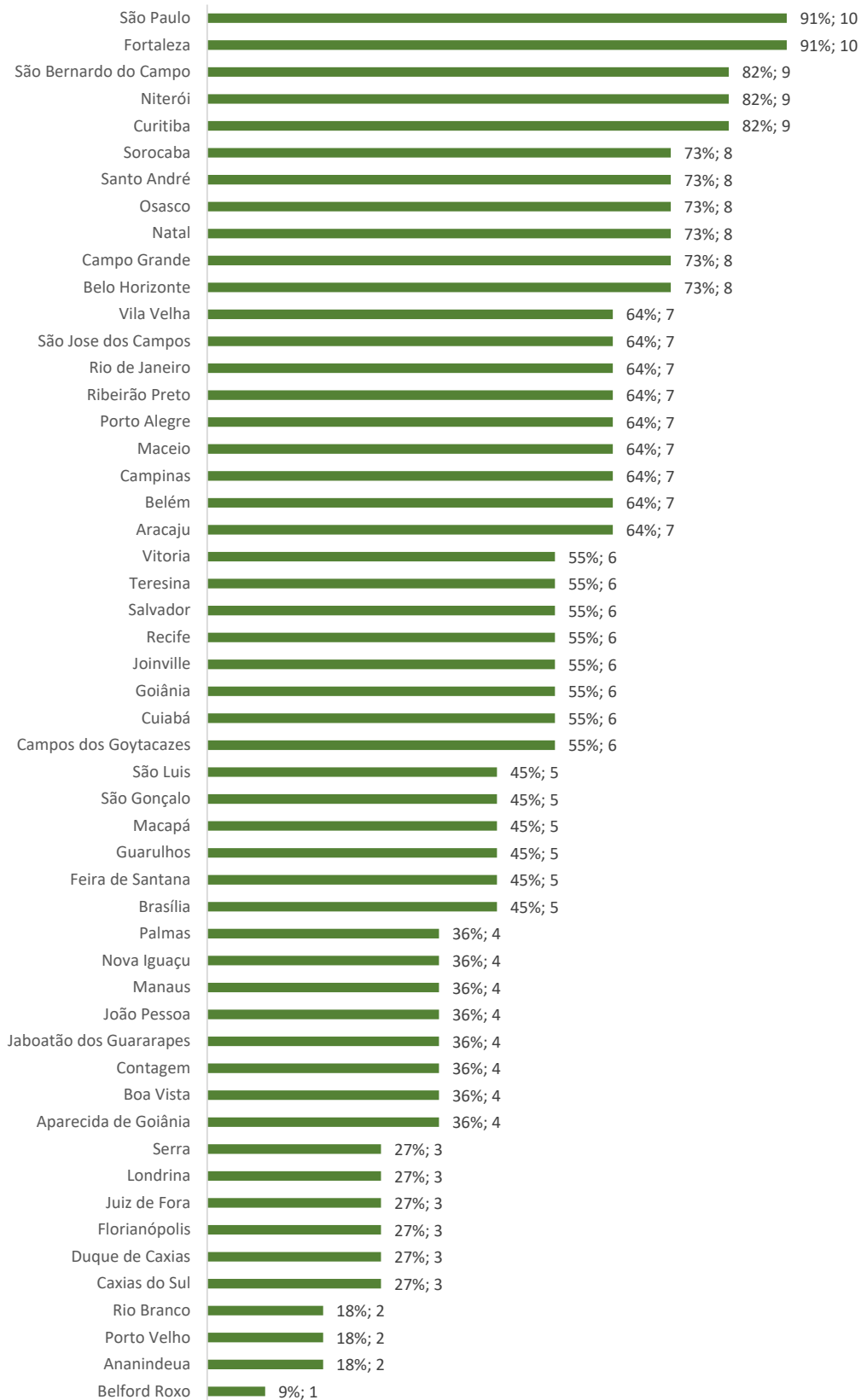
**Figure 11. Adherence of municipalities to content provision indicators**

Source: LOSI.br study



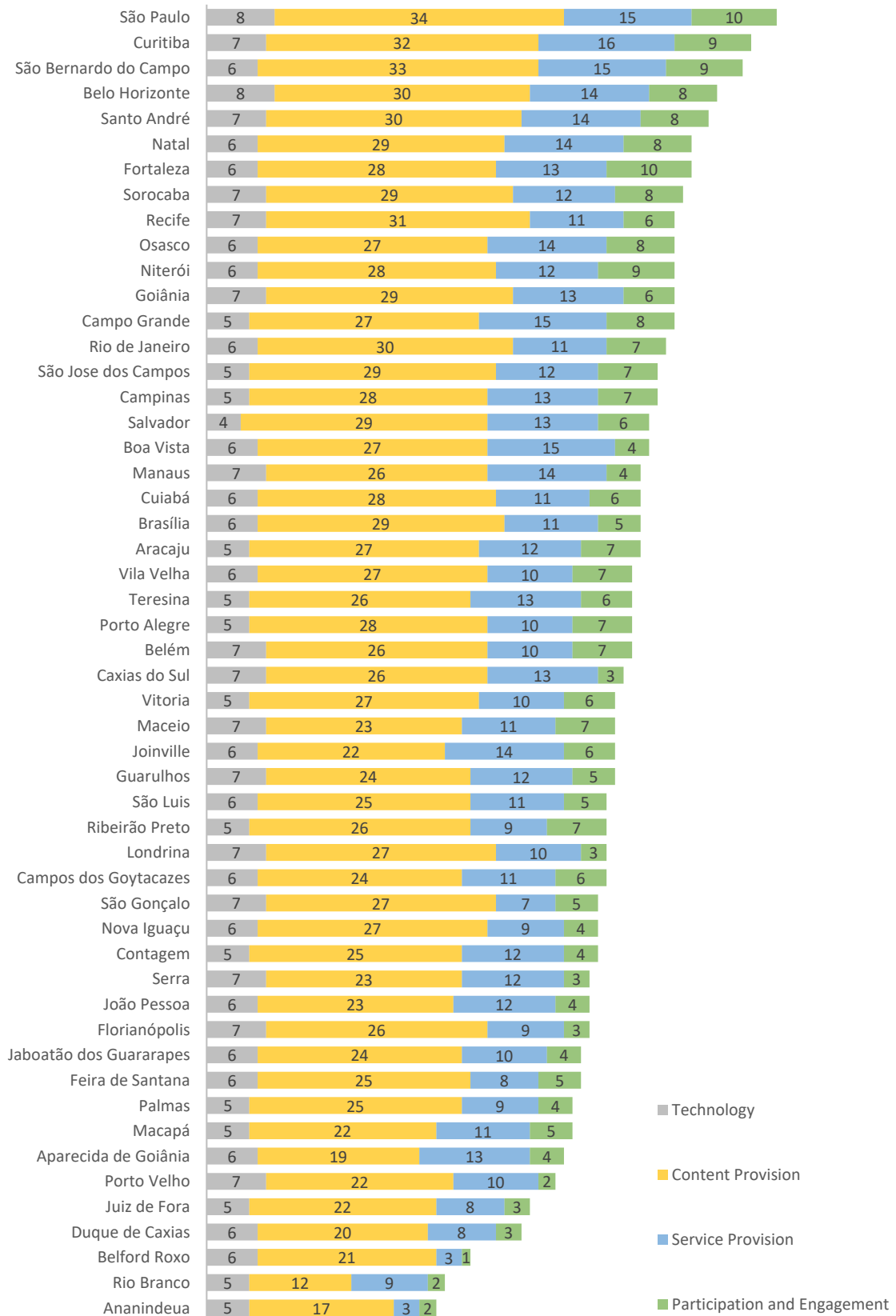
**Figure 12.** Adherence of municipalities to service provision indicators

Source: LOSI.br study



**Figure 13. Adherence of municipalities to participation and engagement indicators**

Source: LOSI.br study



**Figure 14. General compliance of municipalities for Losi indicators**

Source: LOSI.br study

Finally, the LOSI was calculated for the municipalities, as shown in Table 3, considering 74 indicators evaluated.

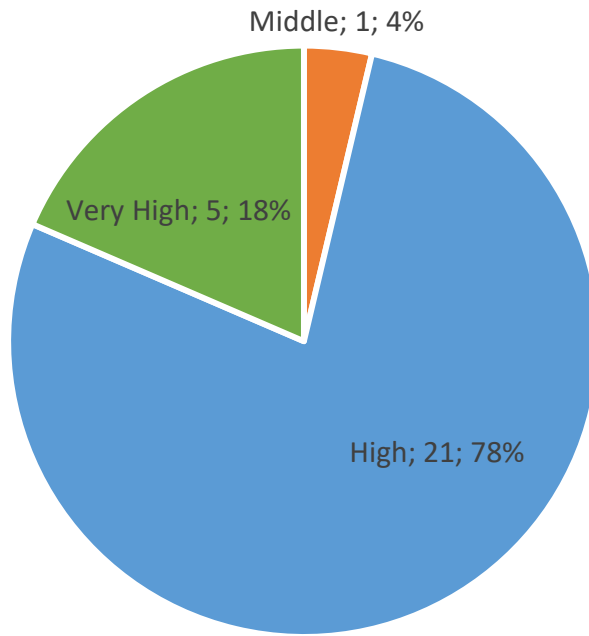
**Table 3. LOSI calculated for the municipalities**

Municipality/State	LOSI	Municipality/State	LOSI
São Paulo/SP	0.905	Caxias do Sul/RS	0.662
Curitiba/PR	0.865	Guarulhos/SP	0.649
São Bernardo do Campo/SP	0.851	Joinville/SC	0.649
Belo Horizonte/MG	0.811	Maceió/AL	0.649
Santo André/SP	0.797	Vitoria/ES	0.649
Fortaleza/CE	0.770	Campos dos Goytacazes/RJ	0.635
Natal/RN	0.770	Londrina/PR	0.635
Sorocaba/SP	0.757	Ribeirão Preto/SP	0.635
Campo Grande/MS	0.743	São Luis/MA	0.635
Goiânia/GO	0.743	Contagem/MG	0.622
Niterói/RJ	0.743	Nova Iguaçu/RJ	0.622
Osasco/RJ	0.743	São Gonçalo/RJ	0.622
Recife/PE	0.743	Florianópolis/SC	0.608
Rio de Janeiro/RJ	0.730	João Pessoa/PB	0.608
Campinas/SP	0.716	Serra/ES	0.608
São Jose dos Campos/SP	0.716	Feira de Santana/BA	0.595
Boa Vista/RR	0.703	Jaboatão dos Guararapes/BA	0.595
Salvador/BA	0.703	Macapá/AP	0.581
Aracaju/SE	0.689	Palmas/TO	0.581
Brasília/DF	0.689	Aparecida de Goiânia/GO	0.568
Cuiabá/MT	0.689	Porto Velho/RO	0.554
Manaus/AM	0.689	Juiz de Fora/MG	0.514
Belém/PA	0.676	Duque de Caxias/RJ	0.500
Porto Alegre/RS	0.676	Belford Roxo/RJ	0.419
Teresina/PI	0.676	Rio Branco/AC	0.378
Vila Velha/ES	0.676	Ananindeua/PA	0.365

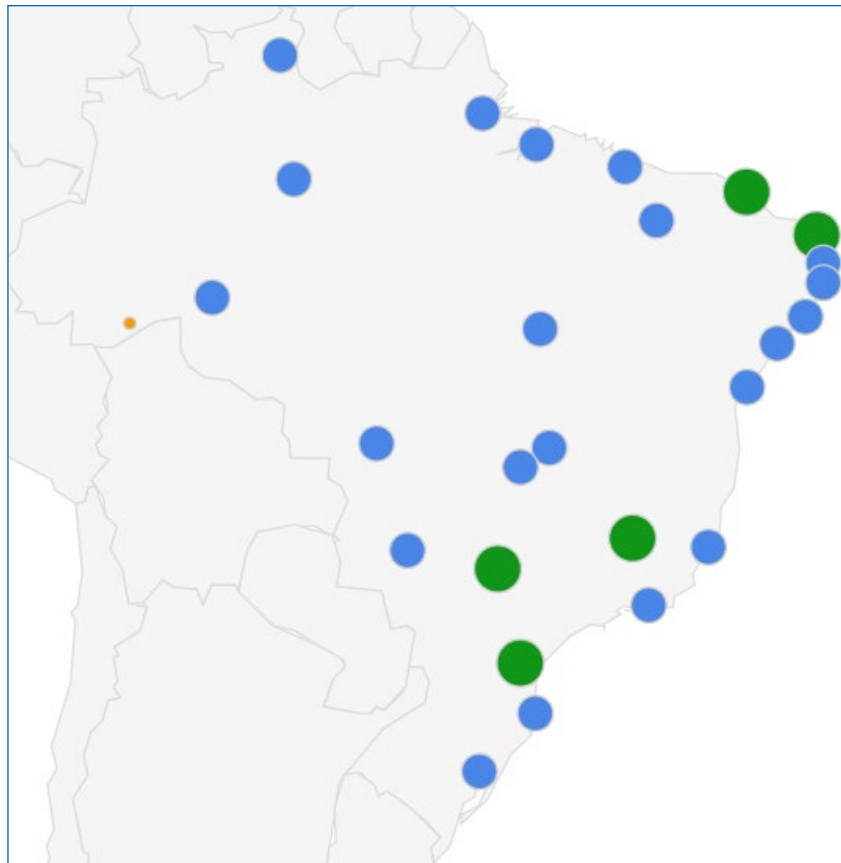
Source: LOSI.br study

### 3.2 Stratified analysis

There was a slight variation in the indicators between the analysed strata. Among the capitals (26 cities) and the Federal District, 18% (5) are at the very high LOSI level, corresponding to 71% of all the evaluated municipalities that achieved this level. Another 78% (21) are at the high level, and only one is at the middle level (Figure 15; Figure 16).

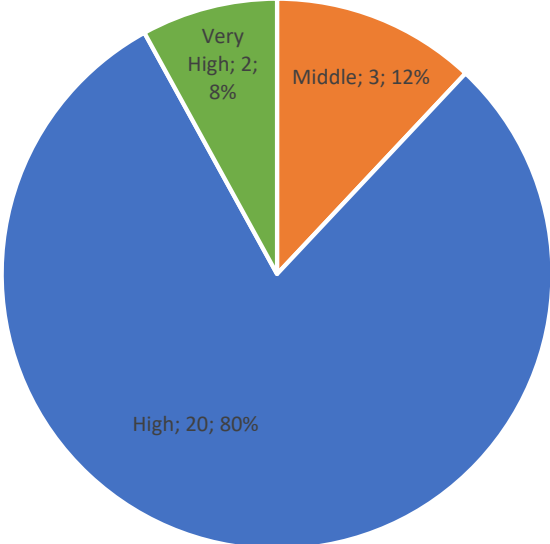


**Figure 15.** Distribution of capitals and Federal District through Losi maturity levels  
 Source: LOSI.br study



**Figure 16.** Geographical distribution of capitals by LOSI maturity level.

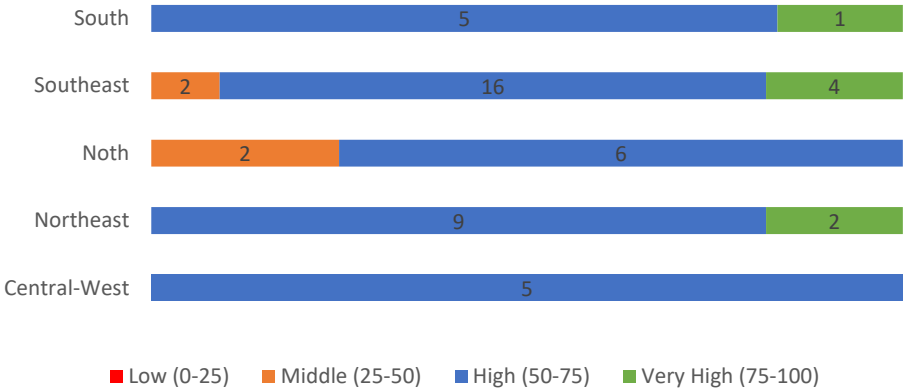
The analysis of the 25 non-capital municipalities (Figure 17) shows that two are classified at the very high level, 20 (80%) at the high level, and three belong to the middle level.



**Figure 17. Distribution of non-capital municipalities by LOSI maturity levels**

Source: LOSI.br study

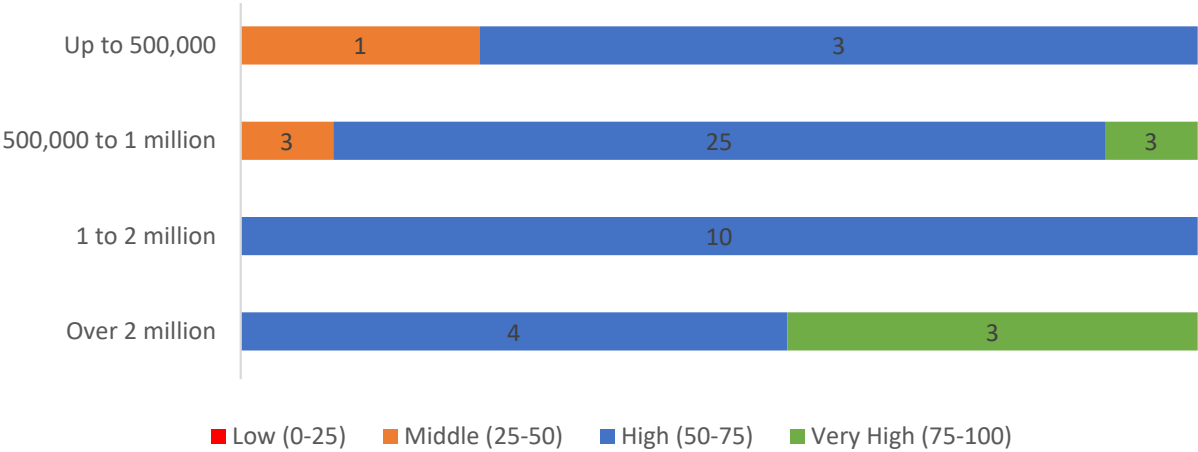
The distribution of municipalities by maturity level and macro-region shows a balance between regions in the distribution of LOSI maturity levels (Figure 18). Of the six municipalities surveyed in the South region, one is at the very high level, and five (83%) are at the high level. Of the 22 municipalities investigated in the Southeast region, four are at the very high level, 16 (73%) at the high level and two at the intermediate level. In the North region, with eight municipalities investigated, no municipality is at the very high level, six are at the high level (75%), and two are intermediate. Of the 11 municipalities in the Northeast region, two are at the very high level, and nine (81%) are at the high level. Finally, in the Central-West region, all five municipalities are at the high level of LOSI maturity.



**Figure 18. Distribution of municipalities by macro-region and Losi maturity levels**

Source: LOSI.br study

Concerning the population, the municipalities were aggregated into four ranges (Figure 19). The four municipalities in the sample with up to 500,000 inhabitants are capital cities, three of which were classified at the high level. In the range between 500,000 and 1 million, corresponding to 31 municipalities, three are at the very high and 25 (80%) at the high level. All ten municipalities are at the high level in the range of 1 to 2 million. Of the seven municipalities with over 2 million inhabitants, three are at the very high and four at the high level.



**Figure 19.** Distribution of municipalities by population size and LOSI maturity levels

Source: LOSI.br study

# 4. Conclusions: Challenges, Opportunities and Recommendations

**T**he results of the 2021 LOSI survey in 52 Brazilian municipalities showed that the city hall portals have, in general, a high level of adherence to the 74 observed indicators. This good performance may be related to the sample of municipalities in the survey. Historically, state capitals and the most populous cities present better results in the ICT Electronic Government surveys (Cetic.br, 2020b). Furthermore, in the stratified analyzes of this sample, no significant differences were observed between capitals and non-capitals, region and population size.

The results of each dimension showed that, in general, the municipalities investigated need to improve the forms, resources and tools for citizen participation and engagement. Regarding the dimensions of content provision and the provision of online services, in general, city hall portals already have a certain ‘maturity’ and are advanced. In the technology dimension, which assesses adherence to international accessibility standards and others defined by the W3C, portals still fail to meet these standards.

Regarding the online public services and telehealth to face the COVID-19 pandemic made available by city halls<sup>1</sup>, in summary, even having analyzed the municipalities with the largest number of inhabitants and state capitals, the offer of services and information is asymmetric. The results also indicate that municipalities’ understanding of what to prioritize differed—some favoured information about the progress of the pandemic, others about municipal health resources to face it. In general, the municipalities prioritized providing information more than online services. In addition, the existence of webpages on COVID-19 portrays the timely reaction to the lack of information about the pandemic. The portals were used as a quick, accurate and timely response to the demand for information to monitor the pandemic’s spread.

The results offered insights to draw ten recommendations that reflect the challenges and opportunities.

**1. Expand online participation and engagement tools:** Adherence to the LOSI indicators was low in the participation and engagement dimension. There is room to expand the digital government portal to provide tools such as online chat, polls and voting, inform the population about the results of previous participatory processes and communicate about future activities.

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<sup>2</sup> Full report: The provision of online municipal information and services in the COVID-19 pandemic. Available in: <https://cetic.br/en/publicacao/pesquisa-sobre-o-uso-das-tecnologias-de-informacao-e-comunicacao-no-setor-publico-brasileiro-tic-governo-eletronico-2021/>

Furthermore, there is an opportunity to improve online tools for gathering public opinion and in city planning processes, such as reviewing the master plan and other city plans.

**2. Adhere to World Wide Web Consortium (W3C) standards:** In the technology dimension that evaluates the technical resources of the portals, none of the evaluated portals passed the W3C accessibility test and validity standards. This result indicates a challenge for developers to follow these standards when developing portals. Therefore, those responsible for information technology in city halls must pay attention to external contracts and internal teams so that the portals meet the requirements evaluated in this dimension.

**3. Regulate the General Data Protection Law (LGDP):** In the city halls' responses to the electronic questionnaire, there is a movement to implement the LGDP, creating working groups, events awareness campaigns and other actions. Nevertheless, there is still a way to go for city halls. In practice observed in the portals, only eleven have a data privacy policy or declaration, for example.

**4. Implement regional integrated e-government solutions and systems:** this was observed in the sample of municipalities in this research, as well as in previous research, such as the ICT Electronic Government survey (Cetic.br, 2020b) and in the studies by Przebylovicz et al. (2018) and Macaya et al. (2020), that there are differences in the development of e-government between municipalities in the same metropolitan region or a population arrangement. Many of the evaluated municipalities are regional hubs that comprise an integrated network in the flow of people, goods and services. However, they are still disparate regarding using digital technologies to offer services to the population, to develop integrated systems and e-government actions. There is an opportunity to expand regional integration in the use of technology or to think of solutions in an integrated way in these local and metropolitan arrangements. It must also be considered that this integration in digital technologies permeates integrated and intergovernmental public governance.

**5. Regulate the Digital Government Law (DGL):** In March 2021, the federal government published the Digital Government Law (Law No. 14,129), establishing rules and instruments for providing digital public services that must be accessible also on mobile apps. The Law also applies to municipalities and must be regulated locally. The regulation of the DGL can enhance the institutionalization and development of digital government policies and strategies.

**6. Use the Brazilian Charter for Smart Cities to guide smart strategies:** Some city halls have stated that they are developing smart city strategies and using advanced technologies. These strategies should be aligned with the Brazilian Charter for Smart Cities. The Letter presents commitments and guidelines for the sustainable digital transformation of cities in the Brazilian context, considering the territorial diversity to overcome social and economic inequalities with the support of digital technologies.

**7. Appropriate best practices and lessons learned in the use of ICT during the pandemic for the management of other areas of public health:** The survey on the use of ICT to face the COVID-19 pandemic showed, for example, the timely reaction from city halls to the lack of information with the creation of webpages and the use of business analytics tools to monitor the pandemic, provide data and information for decision-making. There is an opportunity to

expand this capacity to manage other areas of health, such as monitoring epidemics, tropical diseases and other emergency responses.

**8. Expand policies for digital inclusion, internet access and digital literacy:** people must have access to the internet and digital resources and know how to use them. Therefore, municipalities must think about strategies and concrete actions for the digital inclusion of people. About 28 million people aged ten and over remained offline in Brazil (IBGE, 2021).

**9. Implement concrete e-government actions to put the plan into practice:** It was observed from this research that there are differences between the city halls' answers about e-government plans and strategies with the practice observed in the portals. It is necessary to recognize the progress of e-government in recent years, as pointed out by the ICT Electronic Government survey (Cetic.br, 2020). However, there is still a gap between what is planned and what is executed. Therefore, for the investigated municipalities, concrete e-government actions are expected to be implemented with the support of the state and federal governments and the other stakeholders of the municipality.

**10: Improve data flow:** implement mechanisms and regulations to improve and make visible existing data flows, generating new data types locally by engaging citizens by creating multimodal interfaces and integrating citizen-generated data with other government data sets.

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