Assessment of Transparency and Open Data in Land Administration in Ecuador

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Keywords: cadastre, transparency, geoportal, open data.

SUMMARY

Modern land administration systems face challenges such as urbanization, demand for natural resources, natural disasters, unsustainable land use, and land conflicts, among others; even the last COVID-19 pandemic created disruptions in the normal functioning of land administration systems. To overcome these threats, land systems must adopt models focused on intelligence, interoperability, inclusivity, interactivity, incorporation, and investment. In addition, these new models enhance transparency, accountability, reliability, and ease of use. Good land governance and information and communication technologies are the engines to embrace this change. The current research focused on using geoportals on modern land administration systems in Ecuador; geoportals are part of the outgoing change that aims to use new technologies and open data to offer new services and improve efficiency and transparency. Ecuador has no single land administration system; each municipality manages its cadaster and land registry and performs land use and valuation functions. The central government creates national policies and norms. Still, the local governments are mostly autonomous, so local land administration systems adopt new technologies based on their priorities and available economic resources. For the study, research was done on the online services offered by the 24 provincial capitals, specifically to know if they have active geoportals and what type of information is shared. The main themes or characteristics used to assess the active geoportals were (T1) cadastral information, (T2) thematic information, and (T3) collaborative interface; each theme has its sub-themes with given values for the posed scenarios. This characterization provides a clear overview of the technological transformation in land administration systems in Ecuador, its diversity, and its adaptative capacity. It shows the tendency to adopt new technologies, create new services, and the variety in information shared but also the need for standards and regulations for land information infrastructures and open data.

Palabras clave: catastro, transparencia, geoportal, datos abiertos.

RESUMEN

Los sistemas de administración territorial modernos enfrentan desafíos tales como: urbanización, demanda de recursos naturales, desastres naturales, uso no sostenible y conflictos de la tierra, entre otros; incluso la última pandemia de COVID-19 generó interrupciones en el funcionamiento normal de los sistemas de administración territorial. Para superar estas

amenazas, los sistemas de tierras deben adoptar modelos centrados en la inteligencia, la interoperabilidad, la inclusión, la interactividad, la incorporación y la inversión. Estos nuevos modelos, además, mejoran la transparencia, la rendición de cuentas, la confiabilidad y facilitan su uso. Una buena gobernanza del territorio y las tecnologías de la información y la comunicación son los motores para acoger este cambio. La presente investigación se centró en el uso de geoportales en los sistemas de administración de tierras en Ecuador; geoportales, son parte de este cambio que apunta a utilizar nuevas tecnologías y datos abiertos para ofrecer nuevos servicios, mejorando la eficiencia y transparencia. Ecuador no posee un sistema único de administración de tierras; cada municipio maneja el catastro y registro de la propiedad, además, del uso y valoración de la tierra. El gobierno central crea políticas y normativa nacional, sin embargo, los gobiernos locales son mayoritariamente autónomos y adoptan nuevas tecnologías en función de sus prioridades y recursos económicos disponibles. Para el estudio se investigó los servicios en línea ofertados por las 24 capitales de provincia para conocer si cuentan con geoportales activos y qué tipo de información comparten. Los principales temas o características utilizados para evaluar los geoportales activos fueron (T1) información catastral, (T2) información temática y (T3) interfaz colaborativa; cada tema está conformado por subtemas con una valoración en base a los escenarios planteados. Esta caracterización evidencia la transformación tecnológica en los sistemas de administración de tierras en Ecuador su diversidad y capacidad de adaptación. Muestra una tendencia a adoptar nuevas tecnologías, crear nuevos servicios y la diversidad en la información compartida, pero también la necesidad de estándares y regulaciones para datos abiertos e infraestructuras de la información territorial.

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1. INTRODUCTION

Scarce resources such as land and access to natural resources are among the most critical assets due to their impact on the development of societies; together with rapid urbanization, demand for natural resources, increase in natural disasters, unsustainable land use, or land conflicts increase the challenges for land management [1]. The COVID-19 pandemic was an example of the susceptibility of land administration systems to external factors; stories of success and stress were registered, but above all, it put into evidence the importance of digital transformation in land administration systems [2]. Reinforcing institutional change, adaptability, and capacity development is key to overcoming the problems of the land sector, supporting the global 2030 agenda, and overcoming the new challenges, especially in developing countries where investments in land administration and management solutions have not delivered the expected changes [3]. Land administration and state land management secure tenure and access to land, but threats can appear even in normal conditions when weak land governance exists [4]. In many countries, nontransparent land management and abuse of power have created: land tenure insecurity, adverse impacts on the business climate and economic activities, unequal distribution of land, social instability, social exclusion, informal real estate market, and a decrease in tax revenues [3], [4].

Strengthening good land governance translates into greater transparency and fosters efficiency in land management [1]. Good land governance implies the adoption of various principles, such as transparency, which refers to sharing information and acting openly (visible, understandable, and predictable) [4], [5]. Improving transparency translates into better governance, and improving transparency in land administration should invariably lead to good land governance [6]. Moreover, to tackle effectively common and future threats, modern land administration systems require to work on intelligence, interoperability, inclusivity, interactivity, incorporation, and investment; and explore new services and operational models that enhance transparency, accountability, reliability, ease of use, collaboration, cooperation, and leadership [2]. Additionally, this transformation must create sufficient, simple, and efficient procedures to prevent scenarios that could facilitate non-transparent practices for people inside and outside the system [6].

Information and Communication Technologies are fundamental for simplifying procedures and improving services, helping to solve urban problems, increasing the interaction between government and citizens, and building systems capable of overcoming unexpected disruptions such as the one created by COVID-19. There is a strong correlation between effective land administration service delivery and successful digital transformation programs [2]. Therefore the term smart governance steps into the discussion; smart governance increases participation and transparency under the precepts of good governance and implementing open data access

[7]. The digital transformation, together with information availability and easy access, increase transparency in land markets and improve land administration functions such as value, use, and development [8]. In addition, this new technological infrastructure makes it possible to combine land data with thematic data, converting multipurpose cadasters into sources of information to support decision-making [7].

In Ecuador, land management is a duty of local governments that are decentralized and autonomous; nevertheless, the central government gives policies and regulations. This decentralized environment has originated that 221 municipalities have their land administration department. The capacity of each office is different; usually, large cities have enough economic resources and human capacity; on the other hand, medium and small municipalities require help to maintain proper land administration systems. In the last decade, some municipalities started offering users access to land data through web pages and geoportals. Ensuring free access to data is important because it simplifies processes, demonstrates greater efficiency, and is the central pillar for improving transparency. This digital transformation has slowly progressed, but specific events like natural disasters and the COVID-19 pandemic may have fueled this process. Therefore, the research focuses on assessing open data access through geoportals in the different land administration systems of the provincial capitals of Ecuador. The document begins with a theoretical perspective of land administration, good governance, transparency, and geoinformation technologies. Secondly, the method for assessing the geoportals consists of three stages: defining and characterizing the study target objects (1), identifying themes and sub-themes in the geoportals to analyze (2), and describing the link between the scenarios found and transparency (3). Finally, the results are presented and discussed to give an overview of Ecuador's land administration system regarding open data access and transparency.

2. THEORETICAL PERSPECTIVE

2.1 Land Governance

Governance is a political process through which societies manage and organize themselves, creating a sustainable living environment. It involves policies, legislation, regulations, programs, organizational roles and relationships, implementation capacity, resources, and information systems related to the use and ownership of land [6]. Land governance can be applied when communities have planning offices trained to achieve stakeholder consensus, integrating complementary planning within the social, economic, cultural, and biophysical dimensions to create multidimensional perspectives; local and national governments, state institutions, and the private sector can develop land governance instruments to increase financial and technical resources to support their functions [9]. Good land governance follows the principles of efficiency, effectiveness, transparency, integrity, accountability, subsidiarity, public participation, equity, the rule of law, and sustainability. These principles are related to open and smart governance; open governance requires collaboration, participation, and transparency, while smart governance means open, transparent, and accountable [4], [7]. Smart governance is a collection of technologies, policies, practices, and information that interact to support good government activities [7].

2.2 Land Administration

Land administration is everything related to land management and is usually a government duty; it uses land policy frameworks and information infrastructures to fulfill its functions: land tenure, value, use, and sustainable development [10]. Land administration is commonly seen as an umbrella term that can include the related terms of Land Registration and Cadastre [2]. A competent and impartial legal and institutional framework, with access to reliable information, guarantees property rights and land management's positive impact [11]. Land information usually contains ownership, zoning, value, and land type; it just not provides location but the nature of the place and its relations with people and goods [12], [13]. Modern land information infrastructures also include information on restrictions, responsibilities, and land-related risks [10]. This knowledge enables decision-makers and citizens to plan better, manage, and use resources, providing opportunities for sustainable development in rural and urban areas [12], [13].

2.3 Transparency within Good Land Governance

Transparency is a state-citizen relationship that allows citizens to see the inner workings of governments and monitor their actions [14]. To see the state, citizens must access the information that the government generates as part of their day-to-day; some of the tools used are open data laws, policies, tools, and new technologies [14]. Transparency resembles the availability and flow of timely, comprehensive, relevant, high-quality, and reliable information on government activities for citizens [15].

2.4 Digital transformation in Land Administration

Digital transformation describes the process of moving from a paper-based and manual service delivery mode towards one that operates entirely by digital technologies [16]. Geospatial technologies are used in conjunction with Information and Communication Technologies (ICTs) in land information systems, from data collection and management to data dissemination; these technologies include geo-information systems (GIS), global navigation satellite systems (GNSS), spatial data infrastructures (SDI), geoportals, etc. [17]. GIS solutions have become key to effective land management systems [18]. GIS software and open data do not translate directly into the organization’s value; however, their implementation implies formulating and adopting organizational strategies that will lead to organizational change and, consequently, increased value in offering better services [18].

3. METHODOLOGY

The research applied a mixed method of quantitative-qualitative analysis, which has three stages; the first stage begins with identifying the study target (provincial capitals of Ecuador) and each city's specific context. The second stage defines the parameters to characterize the available geoportals; these parameters are used for data collection and subsequent analysis, adapting the method created by [7]to analyze open data access and transparency in geoportals in Brazil. Finally, in the third stage, an inductive analysis based on evaluating the land data available in active geoportals of each capital was applied to relate the scenarios obtained with open data and transparency concepts.

3.1 Local governments

The first stage characterizes the study objects; autonomy and decentralization are essential factors in land management in Ecuador, but factors such as economic, population, and territorial extension also influence ICTs capacity and parcel registration coverage. The cities' characterization includes area, estimated population, and gross added value (GAV) per capita. GAV is the added value created by all the economic activities carried out in a city.

3.2 Geoportals for access to land open data

The second stage involves identifying the active geoportals and establishing the themes and sub-themes to assess each geoportal. The selected parameters are grouped into three theme categories as shown in Table 1, (T1) cadastral information, (T2) thematic information, and (T3) collaborative interface. Theme T1 covers basic information registered in the cadastre according to Ecuadorian norms. T2 theme refers to thematic information, which base layer is the cadaster, such as land use and city planning guidelines; T3 are additional services implemented in the geoportal that allow interaction with the user, such as downloading the cartography, insert issues, or downloading the cadastral record.

Table 1: Themes and sub-themes for characterizing geoportals. Source: own elaboration based on [7].

Themes	Sub-themes
T1 - Cadastral information	T1.1 – Parcel data
	T1.2 - Owner data
	T1.3 - Tenure data
	T1.4 - Land value
T2 - Thematic information	T2.1 - Land use
	T2.2 - City planning guidelines
T3 - Collaborative interface	T3.1 - Download parcel cartography
	T3.2 - Insertion of issues
	T3.3 - Download cadastral record

Each sub-theme was given a qualifier depending on availability and information accessibility, following the classification in Table 2. In this way, the answers are transformed from qualitative observations to quantitative results to build the scenarios for each city.

Table 2: Characterization of Ecuadorian capitals. Source: own elaboration based on [7].

Themes	Possible responses	Value
T1 - Cadastral information	Not available	0
	Not available. Shows only the perimeter of the parcels	1
	Available. Restricted access (log-in or owner data access)	2
	Available. Open data	3
T2 - Thematic information	Not available or Restricted access	0
	Available. Open access	1
T3 - Collaborative interface	Not available. Restricted access	0
	Available. Open access	1

3.3 Land open data access and transparency in Ecuador

Finally, the third stage links the scenarios found with open data and transparency concepts. This link highlights the cities that have made the most progress in implementing open land data through geoportals and how this booster transparency and good land governance.

4. RESULTS

Geospatial tools for data dissemination, such as geoportals, support land governance primarily because they encompass the principles of transparency and participation. An additional aspect to consider is internet access in Ecuador; according to the national institute of statistics and census of Ecuador (INEC), 53.2% of the population have access to the internet in their home [19].

4.1 Local governments characterization

To understand the specific context of each city, Table 1 shows the population and economic data collected to characterize the capital cities. Quito, Guayaquil, Cuenca, and Santo Domingo are the most populated cities. The highest GAV per capita cities are Orellana, Esmeraldas, Quito, and Guayaquil. In terms of size, the most extensive areas belong to Pastaza, Orellana, Morona, Quito, and Guayaquil; it is important to notice that most of the cities with extensive areas are capitals of the Amazon region, which at the same time are the least populated.

Table 3: Characterization of Ecuadorian capitals. Source: own elaboration based on [20], [21]

Code	Capital	Province	Population (2020)	GAV per capita (2020)	Area (km2)
0101	Cuenca	Azuay	636996	6706.50	3189.44
0201	Guaranda	Bolivar	108763	3380.14	1891.14
0301	Azogues	Cañar	86276	3899.07	612.36
0401	Tulcan	Carchi	102395	4181.57	1820.81
0501	Latacunga	Cotopaxi	205624	5454.68	1384.92
0601	Riobamba	Chimborazo	264048	4443.06	980.67
0701	Machala	El Oro	286120	6885.94	323.62
0801	Esmeraldas	Esmeraldas	218727	8916.03	1340.93
0901	Guayaquil	Guayas	2723665	7697.08	4113.90
1001	Ibarra	Imbabura	221149	4473.40	1103.83
1101	Loja	Loja	274112	4262.55	1894.69
1201	Babahoyo	Los Rios	175281	4819.34	1086.81
1301	Portoviejo	Manabí	321800	4318.09	962.42
1401	Morona	Morona Santiago	58281	3346.06	4647.07
1501	Tena	Napo	77502	2952.99	3912.81
1601	Pastaza	Pastaza	84377	4956.41	19835.19
1701	Quito	Pichincha	2781641	8610.36	4210.91
1801	Ambato	Tungurahua	387309	6030.84	1017.58
1901	Zamora	Zamora Chinchipe	32761	4321.60	1898.70
2001	San Cristobal	Galapagos	9667	5458.88	824.54
2101	Lago Agrio	Sucumbíos	119594	6892.04	3142.54
2201	Orellana	Orellana	93778	10600.84	7046.18

2301	Santo Domingo	Santo Domingo de los Tsachilas	458580	4170.28	3445.36
2401	Santa Elena	Santa Elena	188821	2343.93	3604.21

4.2 Land open data availability in Geoportals

The data collected from the geoportals was organized and analyzed following the parameters and qualifiers described in the methodology; the qualitative data was consolidated in a matrix, Table 3, to facilitate the analysis and transformation into quantitative data. After reviewing the websites, 10 of 24 provincial capitals have active geoportals as a tool to promote access to land data in Ecuador. The subtopics with the best results are Parcel data (T1.1) with 40.30%. In comparison, Tenure data (T1.3) has the lowest results with 4.17%, together with the topic T3 - Collaborative interface where only Quito allows the free download of cartography and no city offers the insertion of issues (T3.2) or download cadastral records (T3.3).

Table 4: Land data available in the geoportals of the capitals (by region). Source: own elaboration.

Region	Code	Capital	T1.1	T1.2	T1.3	T1.4	T2.1	T2.2	T3.1	T3.2	T3.3	Results capitals (%)
Amazon	2101	Lago Agrio	0	0	0	0	0	0	0	0	0	0
	1401	Morona	0	0	0	0	0	0	0	0	0	0
	2201	Orellana	0	0	0	0	0	0	0	0	0	0
	1601	Pastaza	0	0	0	0	0	0	0	0	0	0
	1501	Tena	0	0	0	0	0	0	0	0	0	0
	1901	Zamora	0	0	0	0	0	0	0	0	0	0
Highlands	1801	Ambato	3	3	0	3	1	1	0	0	0	64.7
	0301	Azogues	3	3	0	3	0	0	0	0	0	52.9
	0101	Cuenca	3	3	0	0	1	1	0	0	0	47.1
	0201	Guaranda	0	0	0	0	0	0	0	0	0	0
	1001	Ibarra	3	3	0	0	1	0	0	0	0	41.2
	0501	Latacunga	2	2	0	0	1	1	0	0	0	35.3
	1101	Loja	0	0	0	0	0	0	0	0	0	0
	1701	Quito	3	3	3	3	1	0	1	0	0	82.3
	0601	Riobamba	3	0	0	0	1	1	0	0	0	29.4
	0401	Tulcan	3	3	0	3	1	1	0	0	0	64.7
Coast	1201	Babahoyo	0	0	0	0	0	0	0	0	0	0
	0801	Esmeraldas	0	0	0	0	0	0	0	0	0	0
	0901	Guayaquil	3	0	0	0	1	0	1	0	0	29.4
	0701	Machala	0	0	0	0	0	0	0	0	0	0
	1301	Portoviejo	3	0	0	0	1	1	0	0	0	29.4
	2401	Santa Elena	0	0	0	0	0	0	0	0	0	0
	2301	Santo Domingo	0	0	0	0	0	0	0	0	0	0

Galapagos	2001	San Cristobal	0	0	0	0	0	0	0	0	0	0
Results themes (%)			40.3	27.7	4.2	16.6	37.5	25.0	8.3	0	0	

Cities with the best results for data availability in geoportals are Quito, Ambato, Tulcan, and Azogues, with more than 50% of open access information, as shown in Figure 1. Eight of the ten cities with active geoportals are located in the Highlands region.

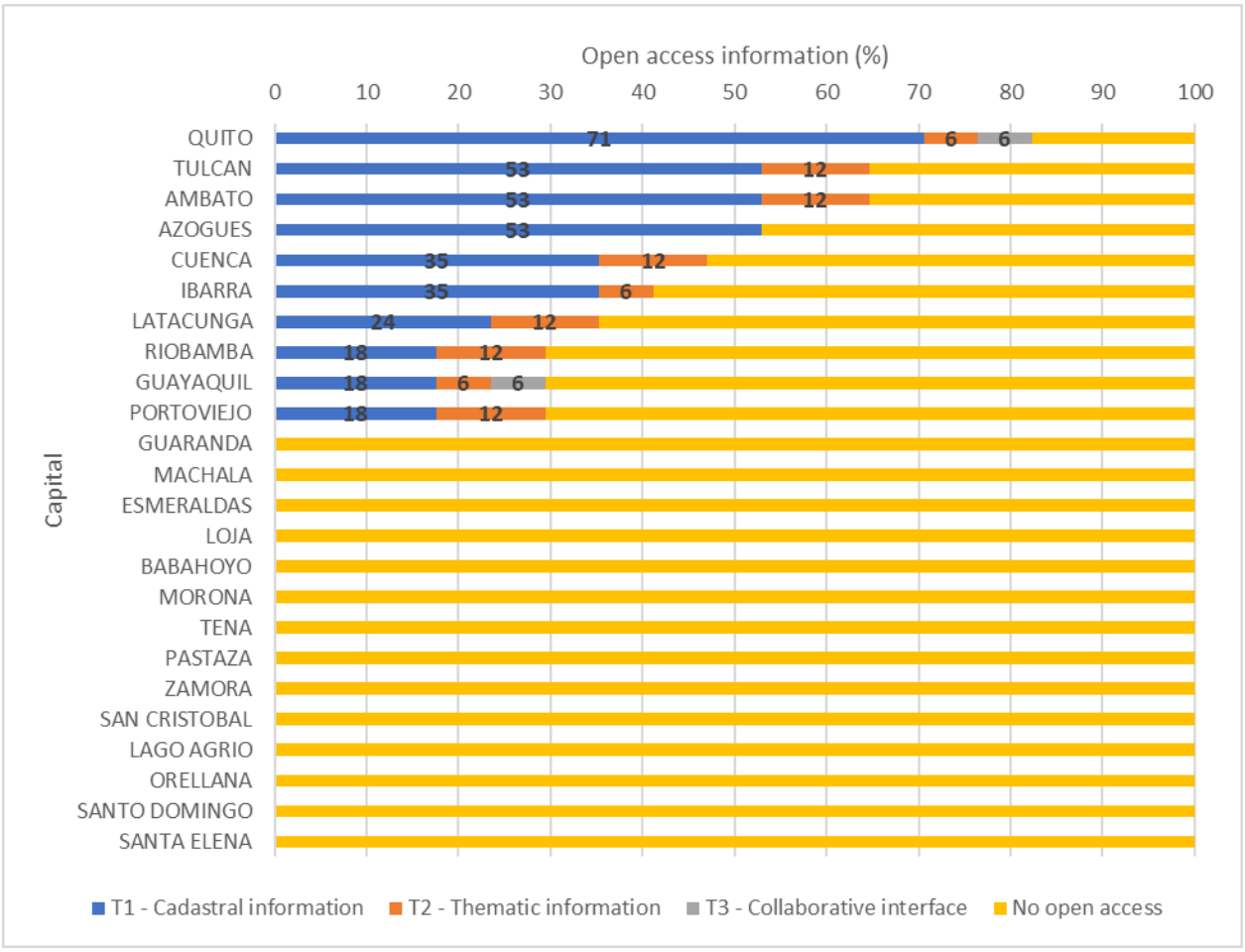

Fig. 1. Analysis of transparency, considering the availability of open access information. Source: own elaboration.

4.3 Land open data access and transparency in Ecuador.

A noteworthy point during the data collection process is that most of the implemented geoportals are recent initiatives. This finding shows a positive trend in using and implementing these tools in the land administration sector. Transparency, as discussed from the theoretical perspective, consists of acting in a visible, understandable, and predictable manner; this highlights the importance of having access to timely, relevant, comprehensive, and reliable information on government activities. Following this line, as shown by the data in Table 4, the

primary land data offered through geoportals are cadastral and thematic information. Figure 2 shows that all cities with active geoportals include at least one thematic data and at least parcel data.

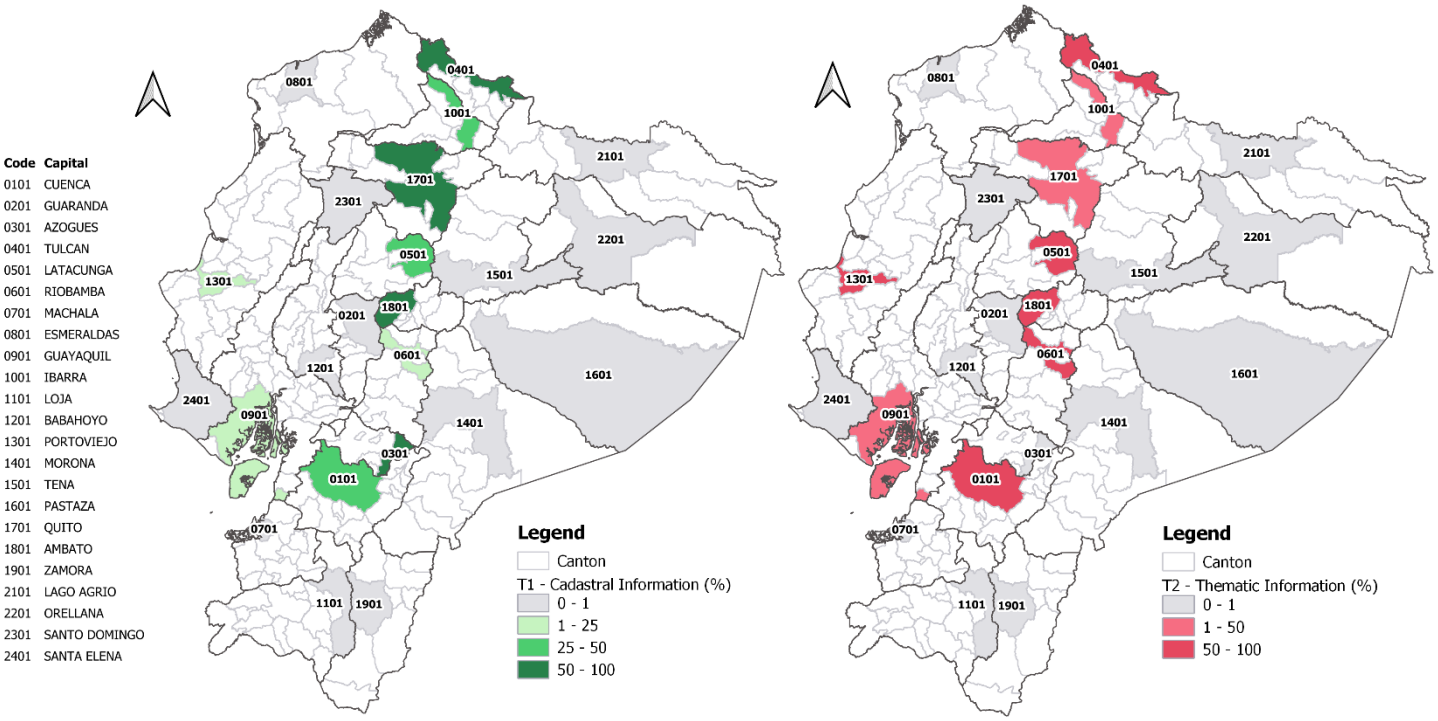

Fig. 2. Analysis of transparency, considering the availability of cadastral information (left) and thematic information (right). Source: own elaboration.

5. DISCUSSION

The provincial capitals of Ecuador have begun implementing geoportals to provide citizens with land information; This trend is more noticeable in the capitals located in the Highlands region. Nevertheless, the use of geoportals is subject to the specific context of each city. The most populated cities with the highest GAV, such as Quito, Guayaquil, Cuenca, and Ambato, are the ones that have started the implementation of geoportals facilitating information management and improving the quality of services offered to citizens. Based on the findings above, it is possible to infer that managing a more significant number of plots and economic and technical capacity plays a vital role in geoportals implementation. This trend contrasts with what happens in capitals in the Amazon region that, despite having the most extensive areas, also have the smallest population and fewer economic sources. In this case, it is essential to note that GVA per capita reflected in these cities is due to the oil industry, and the money from this industry does not stay in the cities. During the data collection was also noticeable that some of the geoportals are recently being implemented or have been boosted after events like natural disasters or the COVID-19 pandemic.

Among the data available in geoportals, the most common are parcel data and thematic information related to land use or city planning. However, other information often available is owner and value data. It is important to highlight that most capitals implementing geoportals have also implemented SDIs or their foundations. One of the most notable cases is Portoviejo; the city's SDI has all the geographic information produced in the municipality, emphasizing risk and planning data. In 2016 the city was one of the most affected by an earthquake, and this natural disaster made them rethink the importance of this information. Portoviejo scores low on open data access because most of the land data require citizens to create an account or is available on another website than directly on the geoportal.

Offering open access to information of public interest handled by the municipality reduces the number of procedures for querying information, such as basic parcel and owner data and city regulations, which prevents land problems due to land grabbing or smuggling. In addition, geoportals, in some cases, are also used to communicate what the local government does, such as future projects and investments. Nevertheless, this still leaves the question of whether all the information shared online is used correctly and whether it violates citizens' privacy. Knowing if citizens are aware of these services, have the necessary technological resources to access them, and if the pages are user-friendly is also essential.

Finally, one of the points not reflected in the geoportals is the collaboration and participation with the user. One of the reasons may be that some cities have different digital channels, besides the geoportals, for inserting issues and requests for cadastral records.

6. CONCLUSIONS AND RECOMMENDATIONS

In recent years, a trend has begun in the provincial capitals of Ecuador; 10 of 24 cities use geoportals to communicate land information to citizens. Geoportals, in most cases, are part of SDIs that contain other types of information and services offered by municipalities. The most common land data available are parcel, land use, and urban planning data, but it is also common to find open-access land owner and value data. Implementing these technologies is linked to factors such as the size of the population, the number of plots, and available economic resources. Decentralization and autonomy in territorial management have created the conditions for various land systems with marked differences in services and data availability to appear. It is also evident that certain events, such as natural disasters or COVID-19, work as breakpoints and push land systems to evolve.

Ecuadorian normative regulate the primary land data that cadastral records must contain, but no regulations specify which data must be publicly accessible. However, normative to standardize SDIs and Geoportals and politics that promote equitable development of land administration systems are needed, as most of the cities with active geoportals are located in the Highlands region.

It is important to conduct a deeper evaluation of the digital land services offered by the municipalities, not only to consider the geoportals but all the online services, and also to consider whether the population is aware of these services and has the technological skills and resources to access them.

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