Article

Benchmarking Geospatial High-Value Data Openness Using GODI Plus Methodology: A Regional Level Case Study

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Abstract: The 2019 European Open Data Directive identifies geospatial data as data that could have a major impact on human activities (high-value data, HVD) and advocates its provision as open data (OD), i.e., without barriers to access and re-use. Although Croatia has implemented OD policies to support the provision of open data, many geospatial data are still not available, or if available, their level of openness ranks Croatia lower than Slovenia and Serbia on some ranking lists. Benchmarking tools have proven to be a powerful tool in identifying barriers in OD. This paper, therefore, benchmarks the level of openness and provision of geospatial HVD in Croatia, Slovenia and Serbia, using the extended and modified Global Open Data Index methodology (GODI Plus). It is expected that this will provide an answer to the status of OD policies and government engagement in OD in Croatia and identify good OD practices among the three countries analyzed. Furthermore, the results will be a baseline benchmark for future HVD analyses. The results reveal low data openness for Croatia and Serbia, high data openness for Slovenia, and a low level of government engagement in all three proposed countries.

Keywords: open government data; geospatial high-value data; benchmarking; assessment framework

1. Introduction to Geospatial High-Value Datasets as Open Data

New technologies have made it possible to collect geospatial data faster than ever before. More data available led to the idea of sharing it instead of collecting it from scratch, which paved the way for open data (OD)—data available to anyone without barriers to access and re-use. Governments hold and manage large amounts of official geospatial data and therefore play a key role in this process. In Europe, government data are defined as data or information produced, collected, or paid for by public bodies [1]. The potential of open government data (OGD) for re-use—both from an economic and societal perspective—is evidenced by extensive research carried out in the last decade (see, e.g., [2–9]). The relevance of OGD in Europe was endorsed two decades ago, first with the adoption of the so-called EU Public Sector Information (PSI) Directive of 2003 and later in the revised PSI Directive of 2013, but it was not until 2019 and the so-called EU Open Data Directive that government agencies were obliged to open their data [10]. The Open Data Directive not only accelerated the provision of open data, in developing countries especially, but also identified data that could have a major impact on human activities—so-called high-value datasets (HVDs). High-value datasets are defined as documents of which re-use is of great benefit to society, the environment and/or the economy [10]. According to the Directive, these data should be made available free of charge, in machine-readable formats via APIs and/or as bulk downloads (Recital 69 of OD Directive). Although not explicitly specifying which datasets are considered as high-value, the Directive proposes six thematic categories for high-value datasets, including geospatial data [10]. In January 2023, The European Commission adopted the list of High-Value Datasets and specifications (see [11])

according to the Open Data Directive of 2019. Our benchmarking was performed in April 2022, so we were not able to use these specifications (list of and characteristics (attributes) of geospatial high-value datasets) in this research.

In 2018, the Government of the Republic of Croatia adopted the National Open Data Policy, which aimed to ensure maximum openness of all public sector information. This policy provides generic guidelines for open data development and suggests five categories of high-value data: geospatial data, environment data, traffic data, statistics and company data [12]. Additionally, in mid-2022, Croatia implemented the EU Open Data Directive of 2019, which emphasizes geospatial data as HVDs. However, despite the existence of a legal framework, many geospatial datasets remain unavailable or if available, accessible for viewing only. An example of such a dataset is street names and house numbers (locations) or data on buildings that are both often used in decision-making processes (e.g., urban planning, transportation).

1.1. Assessment of Open Data Performance

Benchmarking tools have proven to be powerful guidance instruments to measure how well open data performs and which aspects are causing bottlenecks to achieve the full potential exploitation of OGD. These tools differ in methodology and scope of measurements. Some tools refer to the openness on dataset level (Global Open Data Index—GODI [13], Open Data Barometer—ODB [14], Open Data Inventory—ODIN [15]) and some to policies related to open data (OURdata index [16]), while others can cover both datasets and policies (European Open Data Maturity Assessment [17]). As they vary in assessment criteria, the results of the assessments can be different. For example, GODI results show a lower level of data openness for Croatia than for Serbia, while the Open Data Barometer shows the opposite for the year 2016 [13,14]. In addition, GODI benchmarking results rank Croatia lower than its neighbors, Slovenia and Serbia [13]. While Croatia and Slovenia are EU member states and have implemented European regulations, open data in Serbia rely only upon the national political will. However, as a potential-candidate EU member state, Serbia's open data policy needs to be compatible with EU Directives.

Data openness is believed to be highly correlated with the engagement of government agencies in OD. In their work, ref. [18] propose an Open Government Maturity Model (OGMM) to assess the level of maturity of government agencies that see data openness as a segment of OD maturity. However, OGMM OD maturity does not rely solely on data openness; it also includes other indications of government engagement in OD, such as open participation and open collaboration.

1.2. Aim of This Paper

With the implementation of open data directives and policies, the Croatian authorities have opened some of their geospatial data, but not in a fully accessible way. Most of these data are only available for viewing purposes, which prevents their re-use potential. As the level of data openness and provision depends on national OD policies, this paper aims to assess the openness and provision of government geospatial data considered as high-value data in Croatia, Slovenia and Serbia, using the GODI Plus methodology to give an answer to the following questions:

RQ1: How well do OD policies in Croatia support and promote the provision of geospatial HVD;

RQ2: To what extent do government agencies in Croatia engage in the implementation of OD policies;

RQ3: Are there good OD practices in Slovenia and Serbia, as neighboring countries with similar socio-economic characteristics?

Our study assesses the openness levels of geospatial high-value datasets in Croatia, Slovenia, and Serbia. By identifying gaps in existing open data policies, our results can inform improvements that will enable more open government geospatial data. The results of the assessment will also indicate the extent of engagement in the provision of open

geospatial data by different government agencies. This might show if the existing OD policies are not compelling enough. Furthermore, our comparison of these three countries will place Croatia's open data context in a broader perspective and highlight potential best practices that can be adopted to improve Croatia's open data initiatives. All three countries used to form part of the same country until a few decades ago, meaning their (open) data market had to pass or is going through the same transitions. Slovenia and Serbia have similar socio-economic characteristics as Croatia (small- to medium-size countries, population, gross domestic product, . . .), so the assessment results are relevant and strongly based on these similarities. While Croatia and Slovenia are member states of the EU and are obliged to implement European regulations, open data in Serbia relies only on the national political will. Therefore, this comparison might reveal good practices that may serve as guidelines to Croatia on how to improve its open data.

The generic nature of the assessment criteria, not being country-specific, allows for the replicability of the benchmark in other countries as well. With the adopted list of high-value data to be implemented in the EU member states in the near future, the assessment of openness of certain geospatial HVD presented in this paper can be valuable for future openness assessments. By setting this "zero benchmark" as a baseline measurement, researchers or policymakers can use it as a reference point to measure progress, identify areas for improvement, and evaluate the effectiveness of policy interventions.

1.3. Reading Guide

The rest of the paper is structured as follows: Section 2 (Theoretic Framework) describes the theory of benchmarking and explains the Global Open Data Index framework and the Open Government Maturity Model. Section 3 (Methodology) explains how the benchmarking tool was adapted for the purpose of the assessment and includes a list of the indicators used, with scoring schema and guidelines on how to interpret the total score. The results of the assessment for each geospatial high-value dataset per country are presented in Section 4, while Section 5 (Analysis) describes the interpretation of the results. Finally, in Section 6, we present a summary of the findings and provide directions for future research.

2. Theoretic Framework

This section describes the theory and nature of benchmarking in Section 2.1. Section 2.2 explains the existing methodology of the Global Open Data Index, and in Section 2.3, we elaborate on the levels of maturity proposed by the Open Government Maturity Model.

2.1. Theory of Benchmarking

In general terms, a benchmark is defined as a standard [19] for something to be compared with [20], and in the context of OD, it is used for comparison of countries' progress, usually in the publication and use of open data [21]. Benchmarks differ from other evaluation approaches. Based on comparison, they identify best practices that can serve others as an example how to improve their performance [22]. Hence, in this paper, we understand the distinction between a benchmark, a tool, and other forms of evaluations (e.g., assessment framework), which are used to assess the level of openness but not to create rankings lists. However, within the scope of this paper, the terms assessment, evaluation and measurement are all considered synonyms of benchmarking. According to [23], the goal of benchmarking is to provide arguments for the improvement of the outcome in a particular situation. This can lead to greater or improved data provision, which may result in a higher level of data re-use where social, economic, and other benefits of open data can be unlocked. It is, therefore, important to perform benchmarking and follow-up measurements regularly so their results will encourage governments in their efforts to open their data [21]. Several benchmark tools were developed to measure different aspects of OD. Different purposes and approaches caused them to be diverse in methodologies and scoring [24]. For example, according to the ODIN report [15], wherein OGD progress was assessed, Lithuania ranked 17th out of 187 countries, while the OURdata index [16],

measuring government performance, ranked Lithuania at the very bottom of the list—32nd out of 32 countries assessed. These results prove that a country's score can be quite meaningless and subjective, with the potential to cause misleading public perceptions of open data status. However, the ranking results, even though subjective, may provide an incentive that could help policymakers to improve existing OD policies.

2.2. The Global Open Data Index (GODI)

The GODI framework, created by the Open Knowledge Foundation Network, was developed as an independent benchmark focusing on the availability of open government data enabling different stakeholders to track a government's progress on open data release [13]. GODI crowdsources its data, meaning that anyone, from any place, can participate and contribute to GODI. The methodology of GODI changed over time with the current version in use since 2016. The GODI benchmark measures data openness for 15 data categories [13]. Only four of the categories are recognized as geospatial high-value data: Land Ownership (LO), Administrative Boundaries (AB), Locations (LOC) and National maps (NM). Two of these, LOC and NM, were identified by the EU Open Data Directive as potential high-value datasets [10], while the other two can also be classified within the same categorization due to their importance and re-use potential [25]. Land ownership refers to maps of land and land registries with information on registered parcels of land. Administrative area in the AB dataset is defined as a part of a territory over which an administration establishes authority, defined by its boundaries. Within the scope of the GODI benchmark, AB measures data available on two organizational levels (if the second one exists): federal or country level (1) and municipality level (2). Locations refer to ZIP-code addresses and corresponding geospatial coordinates of public and private buildings. National Maps mean geographical maps of the country, including national traffic routes, stretches of water, and markings of heights at a scale of at least 1:250,000 [13].

GODI methodology documentation states that every assessed dataset should be measured with at least three characteristics that describe its content (Table 1). In case one of them is missing, the dataset is considered 'not published' [13]. This indication may appear to be a very strict methodology, but the characteristics used in data measurement are the minimal requirements for the dataset to be usable (minimal data context). For example, administrative boundaries without borders and names cannot be interpreted in a correct way. However, the GODI methodology does not state that all characteristics should be found in the same dataset if such a dataset is not available.

Table 1. Global Open Data Index Categories Characteristics [13].

Land Ownership	Administrative Boundaries	Locations	National Maps
Parcel boundaries	Coordinates of administrative zones (latitude, longitude)	ZIP-code addresses	Markings of national traffic routes
Parcel ID	Name of polygons	Coordinates	Markings of relief/heights
Property Value (price paid for transaction or tax value)	Borders of polygons	Data available for entire country	Markings of water
Tenure Type (public, private, etc.)	/	/	National border coordinates (+EPSG reference)

To determine the level of data openness, GODI benchmark methodology assesses data using 11 indicators [13]:

- Are the data collected by the government (or a third party related or linked to the government)?
- Are the data available online without the need to register or request access to the data?
- Are the data available online at all?
- Are the data available free of charge?
- Where did you find the data?

- How much do you agree with the following statement: "It was easy for me to find the data"?
- Is the data downloadable at once?
- Data should be updated every [time interval]: Are the data up-to-date?
- Are the data openly licensed/in public domain?
- Are the data in open and machine-readable file formats?
- How much human effort is required to use the data (1 = little to no effort is required, 3 = extensive effort is required).

These indicators are formulated to reflect the legal, technical, or practical 'openness' of the data to reduce bias towards single aspects of openness. The list of indicators and their extensive descriptions can be found in [13], in the methodology section. Although these indicators provide a good basis for assessing the performance of open government data, they do not assess the level of government engagement.

2.3. Open Government Maturity Model (OGMM)

The authors in [18] argue that existing assessment models are not designed to fully reflect on the main principles of open government data (participation, collaboration, and transparency) and that these principles may not be achieved without government progress being measured. This means that the benchmarking of government engagement in OD is crucial for the development of OGD. In their work, [18] also propose an OGMM that identifies five maturity levels that can track government engagement in OD: initial conditions (1), data transparency (2), open participation (3), open collaboration (4) and ubiquitous engagement (5). Initial conditions focus on government efforts to aggregate, gather, and publish data for citizens, while data transparency level concerns aspects that allow the access to and re-use of data (e.g., data completeness, quality, etc.). The following three stages are no longer one-way communication, and citizens (public) get to be engaged. Bearing in mind that open participation means the involvement of the public, public inclusion in OD can be of high value to the government with respect to their data. Open collaboration, as maturity level 4, concerns the interaction of government with the public, where non-experts can help in solving certain governmental issues [26]. At the final stage, which fulfills all the previous ones, it is easier to maximize the benefits coming from open data. This means that many of the issues no longer exist and that the impacts of open data can be fully realized. This final stage is described as 'a norm for government culture' [18]. When compared with OGMM, GODI indicators mainly fall within the first two levels of maturity: initial conditions and data transparency, which is why the assessment framework used in this paper was extended by additional, maturity-related indicators.

3. Methodology for Assessing Openness of Geospatial High Value Datasets

For this research, we used the extended GODI methodology—GODI Plus, which builds on the existing GODI framework. The GODI framework base was chosen because it is the only assessment tool that covers all three assessment prerequisites: (1) it considers openness on a dataset level, (2) it includes geospatial (high-value) data, and (3) it covers all three proposed countries. Open Data Barometer (ODB) does not cover Slovenia [14], and Open Data Inventory is focused on statistical data rather than geospatial data [15]. The GODI methodology, however, showed limitations in terms of indicators and the indicators' values, which is why it was modified and extended within the GODI Plus framework.

3.1. GODI plus Benchmark Framework

The first GODI indicator, *Is the data available online at all?*, which describes if the data are available online after registration/authentication/identification, was found closely related to the indicator *Is the data available online without the need to register or request access to the data?*, and it was included in the scoring system of GODI Plus (Table 2). Additionally, benchmarking with GODI is usually carried out by OD enthusiasts rather than experts, and some indicators, such as *How much do you agree with the following statement: 'It was easy*

for me to find the data.' and *How much human effort is required to use the data,* were found to be irrelevant for the assessment and were left out in GODI Plus, as this assessment is carried out by expert researchers.

Table 2. GODI Plus benchmarking framework.

Indicator	Description	Indicator Values {Weight in Final Score}	Score	Final Score
[1]	[2]	[3]	[4]	[5]
Are the data collected by government (or a third-party related or linked to government)?	All data paid for by the government	Yes No	Yes/No	[4]
Are the data available online?	Available for: download, view only, not available. WFS * is downloadable. WMS ** is view only unless its structure suits the dataset, e.g., topographic map	API, download or involving service without restriction of access {1} API, download or involving service with registration or request {0.75} View only without restriction of access {0.5} View only with registration or request {0.25} Registration and/or request {0}	15	[3]*[4]
Are the data available free of charge?	Free of charge for: download, view only, for a fee. WFS is downloadable. WMS is view only unless its structure suits the dataset, e.g., topographic map.	API, download or involving service free of charge {1} API, download or involving service free of charge with registration {0.75} View only free of charge {0.5} View only free of charge with registration {0.25} For a fee {0}	15	[3]*[4]
Where did you find the data?	The point of access	Source name		
Are the data downloadable at once?	Downloadable via APIs, bulk download or WFS. If available partially (in more files), it is downloadable at once. WMS is view only unless its structure suits the dataset, e.g., topographic map.	Downloadable at once without restriction {1} Downloadable at once with registration/authentication/identification {0.5} View only {0}	15	[3]*[4]
Data should be updated every [time interval]: are the data up-to-date?	Based on its reported update time interval	Up to date {1} Not up to date {0}	15	[3]*[4]
Are the data openly licensed/in public domain?	Open license: re-use, share, and modify freely without requesting permission. If no license, not open.	Open license {1} Not open license/private/not known license {0}	20	[3]*[4]

Table 2. *Cont.*

Indicator	Description	Indicator Values {Weight in Final Score}	Score	Final Score
Are the data in open and machine-readable file formats?	In non-proprietary format. De facto standards (proprietary e.g., .doc, .xls, shapefile), are open. WFS (if no authentication), exportable to open formats—open format. If WMS is downloadable, it is open format (if no authentication).	Open format/de facto standard {1} Proprietary/not a de facto format/analogue data/view only (+with authentication) {0}	20	[3]*[4]
Do government portals use social media tools?	/	Yes No Not found	Yes/No/Not found	[4]
Do governments have mobile applications for their data?	/	Yes No Not found	Yes/No/Not found	[4]

* Web Feature Service; ** Web Map Service.

Some original GODI indicators, on the other hand, are not specific enough. For example, the indicator *Is the data available online* does not specify if the data should be available for viewing purposes (without being able to download the data), for re-use purposes with a download option, accessible via APIs but not for download, or for all. Therefore, we defined three main levels of availability in GODI Plus: available for download and/or accessible via APIs, available for viewing only, and not available (Table 2). Open Knowledge Foundation specifies that open data must be *accessible*, i.e., 'should be downloadable via the Internet without charge', but it does not state anything about availability and the distinction of these two terms [27]. In Croatia, there are some geospatial datasets provided for viewing-only purposes, but since these data-viewing services are available free of charge, it could be interpreted as 'open' in some way but not entirely. Furthermore, within *available for download and/or accessible* via *APIs* and *available for view only,* we distinguish available without restrictions (free of charge) and available with registration or request.

GODI assesses in what way OGD is published, but it does not provide any information about the higher levels of maturity of OGD. To reflect upon the higher levels of maturity of OGD, and in line with the OGMM model, in GODI Plus we used two new indicators proposed by [26]: (1) *Do governments' portals use Social Media tools?*; (2) *Do governments have mobile applications for their data?*. Indicator *Do governments' portals use Social Media tools* is related to public participation, whereby users can provide feedback and valuable input for the government for future data provision. Within the scope of this assessment, this indicator reflects on government efforts to support public participation in decision making around geospatial HVDs and focuses on official sources' (portals) functionalities that support participation (e.g., feedback options, data dissemination via social media, etc.). The 'Existence of government applications,' the second added indicator, indicates the availability of geospatial HVDs to anyone at any time via mobile applications from data providers. This indicator identifies if data users can access geospatial data via mobile applications.

The authors in [26] propose a third indicator, *Are APIs enabled for governments' data?*, as part of the Open Collaboration level. This indicator was recognized as a type of data availability and was included in the indicators' values in GODI Plus, where applicable, instead of being introduced as a new indicator.

The proposed two new indicators and a new indicator value additionally reflect on government engagement in OGD and are in line with the principles of OGD (participation, collaboration, and transparency). Indicators are added as the last two indicators in the

GODI Plus benchmarking framework, while the new indicator value was included in other indicators, where applicable.

The complete GODI Plus benchmarking framework with its indicators, values and scores is presented in Table 2. The last two indicators on the list are OGMM-related indicators. In addition, Figure 1 shows a workflow diagram that illustrates how the framework should be implemented in the benchmarking process.
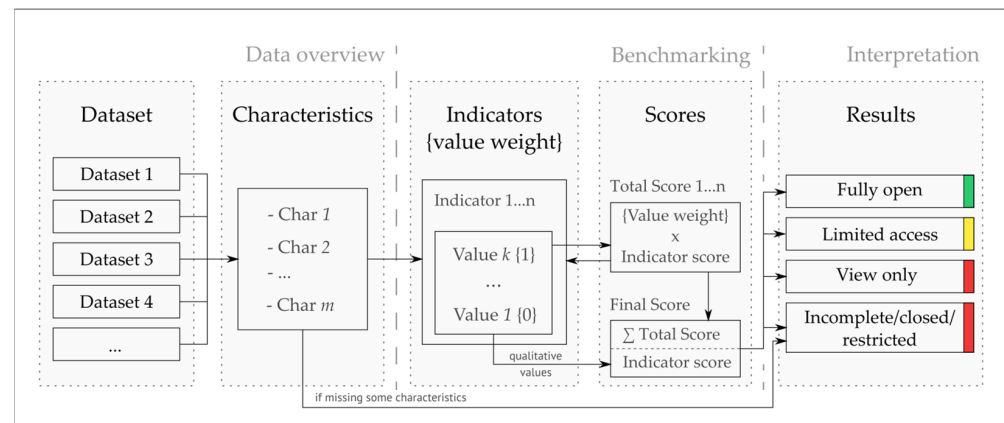
Figure 1. Benchmarking workflow diagram.

3.2. GODI plus Scoring System

Indicators in the benchmark are scored with either 'yes/no' and 15 or 20 points, with a maximum of 100 points in total, same as in the GODI framework. Indicators with a 'yes/no' outcome, such as *Is the data collected by government (or a third-party related or linked to government)?*, are not considered sufficiently SMART (specific, measurable, achievable, relevant and time-bound) but can provide additional information about a dataset or public agency. Indicators assessing higher levels of OGMM can be scored 'yes, no or not found' since in some cases it is unclear whether the information is not available or non-existent.

Characteristics of data (Table 1) can be found in more than one file if a single file is not available (GODI). In that case, data openness will be assessed based on the highest possible level of openness of all the files used in the evaluation. In cases where data are available in more than one form (e.g., view-only and as a WFS service with registration), it is scored based on the most open level of availability. Data availability levels (available for download and/or accessible via APIs, available for viewing only, not available) are weighted correspondingly from 0 (not available) to 1 (unrestrictedly available for download/API) (Table 2). The final score per indicator is then calculated as a weighted score of the weight of the indicator value and the score for the observed indicator (Table 2). Finally, the total score of the data is the sum of the final scores for each indicator.

The GODI Plus results scheme builds on the original GODI results scheme, which is described in detail in [13]. It consists of four levels that are based on the general characteristics of indicator values: data not available, available for viewing only, available with limited access, and fully open. While GODI Plus level ranges follow the original GODI results scheme [13], due to methodological refinements (Table 2, column "Indicator Values"), the interpretation of the results is slightly different. The original GODI considers data with scores below 80 to be potentially downloadable in text or another format and machine-readable, and GODI Plus considers them to be "view only". The results of the benchmarking should be read as follows:

- A score of 0 points: data are incomplete/not available and/or their re-use is limited (data gaps)
- A score < 80 points: data are available to public but as view only, not in open format and/or with no clear terms of use. In many cases, data are available as view only, and with metadata indicating timeliness, license, and the available format (in which the

data might be provided). In other cases, data may not be open and could be incomplete and/or with no metadata indicating quality, availability, format or restrictions.

- A score of 80–85 points: data are available to public free of charge but with required registration/authentication/identification.
- A score of 100 points: data are available and accessible in machine readable format, timely and under open license.

4. Results

This section explains socio-economic characteristics in Croatia, Slovenia and Serbia in Section 4.1. In Section 4.2, we describe the data sources used for benchmarking. Section 4.3 provides our findings per dataset for each country, and we summarize the results of the assessment in Section 4.4.

4.1. Socio-Economic Characteristics of Benchmarked Countries

Croatia, Slovenia, and Serbia are small- to medium-size European countries, with Serbia being the largest and having the highest population and Slovenia being the smallest and least populated out of the three countries [28]. Economically speaking, Slovenia shows the best economic results, with the highest Gross Domestic Product (GDP) per Capita, while in comparison, Serbia has the poorest economic results among the three [29]. Open data impact assessments [30] show that open data has great economic potential, which indicates that part of GDP could be related to OD and especially to high-value datasets [31].

4.2. Data Sources

The proposed GODI Plus benchmarking was implemented through desk research. Data for the research was obtained from official government sources (portals). At least two data portals for each country were used to ensure quality of benchmarking:

- Croatia: National Spatial Data Infrastructure (NSDI) metadata catalogue [32], State Geodetic Administration (SGA) Geoportal [33], Land Register [34], Hrvatska Pošta [35].
- Slovenia: E-Surveying Data [36], Spatial Data Information Infrastructure [37], Real Estate Mass Evaluation Portal [38].
- Serbia: Metadata Geoportal [39], Geosrbija geoportal [40], Real Estate Price Register [41], eCatastre [42], Geosrbija—open data portal [43], The Post of Serbia GIS [44].

The majority of the portals used for the assessment were available in the national language and in English. In Serbia, some of the portals had a user interface using the Cyrillic alphabet.

4.3. Results of applying the assessment framework
4.3.1. Land Ownership Data

When looking at data characteristics, it was found that Croatia, Slovenia, and Serbia all have differently structured jurisdictions over some datasets. This causes parts of the data to be available in different files. The results per country are shown in Figure 2.

Croatia: Croatia scored 0 points for its openness of these data. Its land ownership dataset is considered incomplete, as information about the property value could not be found online. Data on land parcels (boundaries, ID) are available as WMS and WFS services with registration (NSDI metadata catalogue), and tenure could be found in the Land Register. However, property value data are part of eReal Estate platform and are not available online but upon request, making this dataset evaluated as not published. Croatia's portals provide feedback functionalities in email or review form. For part of the data (ID, boundaries), there is no mobile application, but an existing cadaster webpage is customized for mobile phone use.
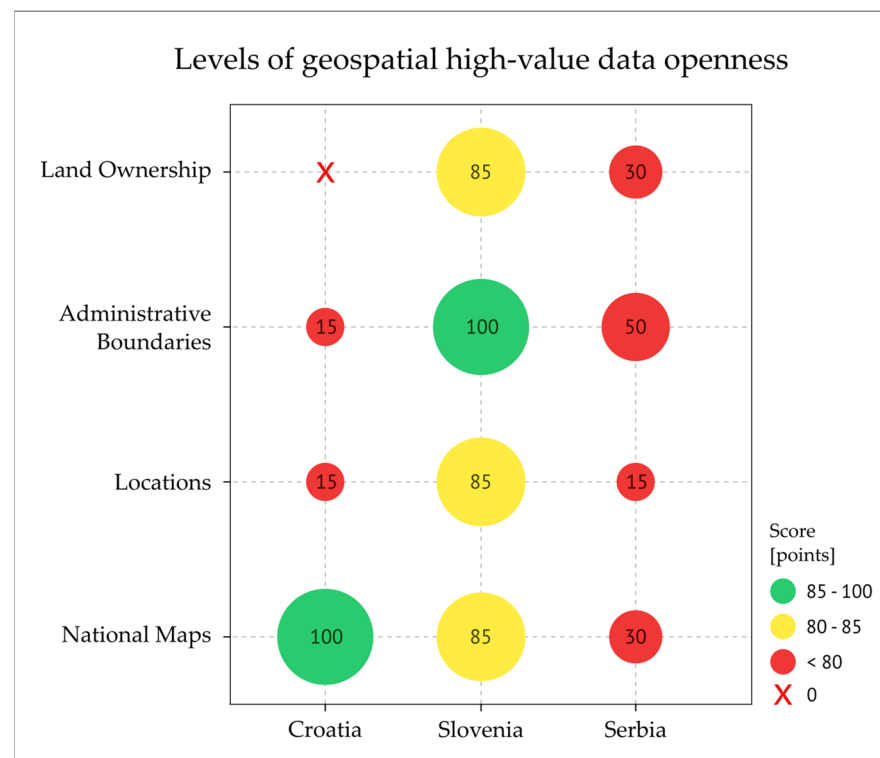
Figure 2. Levels of geospatial high-value data openness for Croatia, Slovenia, and Serbia.

Slovenia: Slovenia scored 85 points for its openness of these data. These data for Slovenia are available in different files. Data on parcel ID and boundaries are available as WMS and WFS services on the Spatial Data Information Infrastructure. Data on property value are available for download (with registration) via the E-Surveying Data portal and as view-only on the Real Estate Mass Evaluation Portal. For tenure type, the E-surveying Data portal providing information on ownership of physical persons is not available to the public, meaning that a legal person's ownership is public. As information can be extracted, these data are considered existing and are found as available but requiring registration. Slovenia's sources support a mail feedback mechanism, and data are not available via mobile applications.

Serbia: Serbia scored 30 points for its openness of these data. Data for parcel ID and boundaries are available as WMS, WFS and as view only on the Geosrbija geoportal. WFS and WMS, available on Metadata portal, can only be accessed with credentials, making the view-only data from the Geosrbija geoportal the reference dataset for the assessment. Property value is available as view only on the Real Estate Price Register, and tenure type is available as view only in the eCadastre. Data are available on the mobile application Geosrbija—Digital platform. Serbia's data sources support mail and review feedback functionalities.

In Appendix A, all findings related to openness of land ownership data in Croatia, Slovenia and Serbia can be found in Table A1.

4.3.2. Administrative Boundaries Data

The three assessed countries have a slightly different territorial organization. This does not change the assessment process, as the methodology foresees the assessment of two levels of administrative boundaries: the national level (boundary level 1) and the municipality level (boundary level 2). Croatia has three levels of administration units: country (national) level, county level (20), and cities and municipalities (555). The City of Zagreb holds the status of both county and city [45]. Serbia also has a three-level organization: country (national) level, autonomous provinces (2) and municipalities/cities

(173). The City of Belgrade is a special territorial unit with 17 municipalities [46]. Slovenia has only two administrative levels: country (national) level and municipalities (212), of which eleven administrations have the status of urban municipality [47]. The results of openness of these data for each country is shown in Figure 2.

Croatia: Croatia scored 15 points for its openness of these data. Administrative boundaries are available as WFS, WMS and view only. WFS and WMS services are found in the NSDI metadata catalogue and are not accessible to non-authorized users. The data available as view only, found on SGA Geoportal, comply to all GODI dataset's characteristics, and it is used as a reference file for benchmarking. The data license prohibits changes, multiplications, and the redistribution of the dataset, and it is considered to be a non-open license. No information about data timeliness could be found. Croatia's portals provide feedback functionalities in email or review form, and data are not available via mobile applications.

Slovenia: Slovenia scored 100 points for its openness of these data. Data are provided as WFS, WMS and bulk download. WMS service is available without restrictions on the Spatial Data Information Infrastructure geoportal, but names of administrative areas, a characteristic of a dataset, are missing. Bulk download data contains relevant data in separate files but requires user registration. The WFS provides all data under the CC BY 4.0 license, and it used in benchmarking. Slovenia's sources support a mail feedback mechanism, and data are not available via mobile applications.

Serbia: Serbia scored 50 points for its openness of these data. Data are available for download as WMS, WFS, and as view only. WMS and WFS required authentication and could not be accessed. Downloadable data, found on the Geosrbija Open Data Portal, are available with registration and were used as the reference dataset. This dataset is missing license and update information and is available in .shp format. Data are available on the mobile application Geosrbija—Digital platform. Serbia's data sources support mail and review feedback functionalities.

In Appendix A, all findings related to openness of data on administrative boundaries in Croatia, Slovenia and Serbia can be found in Table A2.

4.3.3. Location Data

Each of the three countries have different methods of data availability. Even though all three assessed countries have established a Register of Spatial Units with data containing addresses, house numbers, spatial units, ZIP codes, etc., not all of them provide all their data publicly, and in some cases, not even as view only. Results of the openness of location data for each country are illustrated in Figure 2.

Croatia: Croatia scored 15 points for its openness of these data. Data are available in separate files. Data on addresses and house numbers are available as WMS, WFS, and view only. WMS and WFS found on the NSDI metadata catalogue are available only with credentials. The dataset available as view only on the SGA Geoportal is accessible and, therefore, was used for evaluation. Data on Croatia's ZIP codes in Excel form were found on the website of Hrvatska Pošta, the national mail delivery company. Terms of use are related to the SGA Geoportal and can be interpreted as a not-open license. There was no information about data timeliness. Croatia's portals provide feedback functionalities in email or review form, and data are not available via mobile applications.

Slovenia: Slovenia scored 85 points for its openness of these data. Data are available partially, as WFS, WMS, and/or bulk download. The WMS service shows no data to be visualized. The WFS service found on the Spatial Data Information Infrastructure geoportal contains only data attributes and not data geometry. Bulk download, available with registration, does not contain data regarding ZIP codes, but it does have data geometry. Slovenia's sources provide feedback functionalities in email form, and no mobile application was found for these data.

Serbia: Serbia scored 15 points for its openness of these data. Data are available in separate files. Addresses and house numbers are available as view only, in the WMS and

WFS service, and as a bulk download. Involving services require authentication, and a bulk download contains only data attributes, not coordinates. Information about ZIP codes is found on The Post of Serbia GIS portal, as view only. Serbia's portals support user feedback in the form of mail or review, and no mobile application for these data was found.

In Appendix A, all findings related to the openness of location data in Croatia, Slovenia and Serbia can be found in Table A3.

4.3.4. National Maps

National Maps datasets include maps at scales of at least 1:250,000. For Croatia, the Croatian Base Map at a scale of 1:5000 is the largest-scale topographic map. Slovenia's largest-scale map is the National Topographic Map, with a scale of 1:50,000, and Serbia provides a topographic map of Serbia at a scale of 1:250,000. Results of benchmarking for national maps per country are shown in Figure 2.

Croatia: Croatia scored 100 points for its openness of these data. Data are available as WMS without restriction of access and as WMTS with credentials. Maps are available on SGA Geoportal and are provided with the right to be reused and integrated in new, added-value products, crediting the SGA as the owner of the data. Croatia's portals provide feedback functionalities in email or review form, and data are not available via mobile applications.

Slovenia: Slovenia scored 85 points for its openness of these data. Data are available as WMS as well as in form of a bulk download (with registration required). WMS previews provided no data to evaluate. This may have been due to a coordinate reference systems issue. Since no data were found in the WMS service, the bulk-download data were evaluated. Data are found on the E-Surveying Data portal. Slovenia's portals provide feedback functionalities in email form only, and no mobile application was found for these data.

Serbia: Serbia scored 30 points for its openness of these data. Data were found as view only. If the data are available in other forms, they were not discovered due to the Cyrillic letters used on many government portals. Serbia's sources support user feedback in the form of mail or review, and no mobile application for these data was found.

In Appendix A, all findings related to the openness of the national maps data in Croatia, Slovenia and Serbia can be found in Table A4.

4.4. Summary of Our Findings

A summary of the findings on the openness and provision of geospatial high-value data in Croatia, Slovenia and Serbia is shown in Figure 2. As seen in the figure, seven out of twelve results are marked red with scores up to 50 points, indicating major limitations in data access and re-use. Additionally, Croatia did not provide complete data on land ownership and scored 0 points for these data. Results also indicate that, in general, Slovenia had the highest level of HVD openness, with scores of at least 85 points—in contrast to Serbia, whose most open HVD scored 50 points.

5. Discussion

Based on the results, the levels of openness of the high-value datasets were not very high in most cases. Land Ownership analysis showed poor results for Croatia. In Croatia, data on real estate value and parcel boundaries are not maintained by the same agency. Although the benchmarking methodology is flexible enough to include more than one data file (coming from different organizations), land ownership data were considered incomplete since real estate value data were not publicly available, even though they should have been due to the Open Data Directive. This indicates that the lack of open data is caused by other factors not covered in existing open data policies. One of these factors might be the personal nature of Land Ownership data, which contains names of property owners. According to the General Data Protection Regulation, such personal data should not be publicly available. In Slovenia, which scored 85 points in this category, data on land ownership is collected by one institution, the Geodetic Administration.

The results for Administrative Boundaries also show that Croatia ranked the lowest of the three assessed countries. In Croatia, these data are maintained by the State Geodetic Administration, which means that only one party is included in the process of opening the data. Even though the Open Data Directive enforces making the data available, it also anticipates a fee (marginal costs) to be applied to the dataset. For Croatia, data on administrative boundaries are available for view-only purposes, while for other types of access, a fee must be paid. Slovenia, which scored 100 points in this category, has recognized the potential of an administrative boundaries dataset and has provided unrestricted access to stakeholders. Serbia provides these data with user registration, but data are available for re-use.

Location data again showed that Croatia ranks last when compared to Slovenia and Serbia. These data, with characteristics foreseen by assessment methodology, are maintained partly by the State Geodetic Administration (SGA) and partly by the national post-office company. The part of the data under the jurisdiction of the SGA are available for view-only purposes and are in line with the analysis of administrative boundary data. However, ZIP code data, which are under the jurisdiction of the mail delivery company, are publicly available for download. Slovenia, which leads this category with 85 points, also had limitations to openness of these data. Although its OD policies enhance re-use, data were not available to anyone except registered stakeholders. Serbia, which scored the same as Croatia and has a similar data jurisdiction, provides the address part of the data for re-use (not as view only), but the rest of the data were view only.

National Maps within this research are limited to any national map up to a scale of 1:250,000. Results show Croatia as being the leader among the three countries. It provided data as a WMS service with no access restriction, meaning that OD policies are in place for successful data re-use. Slovenia scored 85 points, as its data are available with registration. Serbia, however, scored the lowest with only 30 points in the assessment, as its data were available for view-only purposes.

Finally, from the results obtained in the assessment of the high-value datasets, it was discovered that all three countries in 2022 had not achieved high levels of open data maturity, especially for levels four and five. Since in most cases agencies had not established advanced methods of communication with users other than for mail or review, additional efforts need to be made to meet the requirements of open collaboration. However, Serbia had developed mobile applications to share its data (level 5), but the assessment results show very poor openness of data in general (levels 1–2).

The assessment of data openness was performed in April 2022, so we conducted a scan of the current situation in May 2023. We found that Slovenia implemented a new data application, Public Geodetic Data, to provide unrestricted access to governmental geospatial data. This application serves geospatial data related to cadaster, spatial units, administrative boundaries, and cartographic products that are available as a bulk download without registration. With these improvements, Slovenia made progress in open data accessibility. Croatia also improved in data accessibility, with administrative boundaries now being available as a web service. However, technical issues exist that prevent data retrieval. For the websites used in the benchmarking of Serbia's open data, access was blocked for visitors outside of Serbia. However, we did manage to access some of them and perform the quick scan. This quick scan showed that there were no significant changes in data accessibility.

6. Conclusions

The benchmarking of high-value data in Croatia, Slovenia and Serbia provides valuable information on the status of OD policies and addresses possible issues preventing open data provision. Although the benchmarking results presented in this paper are from 2022, they can still serve as a baseline benchmark and be used to improve OD policies.

RQ1: How well do OD policies in Croatia support and promote the provision of geospatial HVD? The provision and accessibility of geospatial high-value data show that

the current open data policies in Croatia are not prescriptive enough. In the future, they should encourage agencies to provide their data with a higher level of openness; geospatial HVDs should be more accessible for reuse. Agreements among data providers who hold pieces of closely related data could also lead to more effective data reuse. In addition, open data policies should make licenses mandatory for open data publication, emphasize the need for timely data, and cover data availability via APIs; this is because in many cases, the license is missing, there is no information about the last update, and data are not available for re-use by developers.

RQ2: To what extent do government agencies in Croatia engage in the implementation of OD policies? The assessment of government engagement showed the poor function of data portals to increase public participation and collaboration. The assessed data maintained by government institutions varied in accessibility and openness. In addition, in many cases, review (contact) by email is the only way to provide feedback, so new and more at-hand solutions, such as star rating or commenting, should be adopted. These could increase public engagement and result in better quality and more open data. Developing mobile applications to support open data dissemination and re-use could also contribute to unlocking benefits arising from open data.

RQ3: Are there good OD practices in Slovenia and Serbia, as neighboring countries with similar socio-economic characteristics? The analysis of the availability and accessibility of the high-value geospatial data in Croatia, Slovenia and Serbia showed different approaches and level of commitment to open data. Croatia has established a good technological infrastructure for data sharing and has made significant, prerequisite steps towards open data, such as data standardization and digitalization. Although for viewing only, data are openly available and can be used for specific tasks, such as information retrieval. Serbia has set OD policies in place to open its high-value geospatial data. Although it is not obliged to implement European open data directives, Serbia has showed political will and has opened some of its high-value geospatial data for re-use. OD policies in Slovenia have ensured the implementation of an access mechanism to re-use high-value geospatial data and unlock its benefits, albeit through registration. Although open data must be accessible and non-discriminatory, registration mechanisms should not be seen as major obstacles. Once registered, users can unrestrictedly re-use the data and create new applications. Registration can also be beneficial for the government, which can track the needs of users and provide more relevant content. In the context of the present analysis, Slovenia can be seen as a good practice country. Although it offers restricted access, it provides all data assessed in this paper, up to date, with metadata and under open license.

The scan of data openness from 2023 reveals improved data accessibility in Slovenia and Croatia when compared to the results of the assessment from 2022. This indicates that both countries are putting effort into opening their geospatial data. Again, Slovenia is taking greater steps than the other two countries and should be seen as an example of good practice for Croatia and Serbia for their open data. With the adoption of the EU Implementing Regulation 2023/138 in these countries, there will be more rapid developments in open data availability and accessibility. Therefore, it is important to carry out follow-up measurements to track open data development.

Based on the results, future research can be steered in several directions. First, an analysis and comparison of the open data policies in Croatia, Slovenia, and Serbia may provide a deeper understanding of the current results and reveal what others have done/are doing to achieve higher levels of geospatial data openness. Further on, future work can investigate to a greater extent the relationship between data openness and maturity levels proposed by the OGMM. In addition, the generic nature of the assessment criteria, being not country-specific, allows for replication of the benchmark so that new countries can be included to get a wider insight into open data progress. Bearing in mind the newly adopted Implementing Regulation 2023/138, future benchmarking should also consider the proposed list of specific geospatial HVDs and their prescribed attributes. Finally, the implementation of the new regulations for high-value datasets in EU member states

will lead to more open geospatial data. This implementation will require government engagement not only at the policy level, but also in practice. In this sense, repeated benchmarking could reveal the direction of the development of open geospatial data and the maturity of government engagement.

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Data Availability Statement: The data are contained within the article.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. Summary of Land ownership data openness findings.

Indicator	Croatia		Slovenia		Serbia	
	Results	Final Score	Results	Final Score	Results	Final Score
Are the data collected by government (or a third-party related or linked to government)?	Yes	Yes	Yes	Yes	Yes	Yes
Are the data available online?	Not all characteristics found in the dataset	0	Data available for download with registration	11.25	Data available as view only without restriction of access	7.5
Are the data available free of charge?	/	/	Data available for download free of charge with registration	11.25	Data available as view only free of charge	7.5
Where did you find the data?	NSDI metadata catalogue SGA Geoportal eReal Estate		SDII E-surveying Data Real Estate Mass Evaluation Portal		Metadata Geoportal Geosrbija Real Estate Price Register eCadastre	
Are the data downloadable at once?	/	/	Data downloadable at once with registration/ authentication/ identification	7.5	Data for view only	0

Table A1. *Cont.*

Indicator	Croatia		Slovenia		Serbia	
	Results	Final Score	Results	Final Score	Results	Final Score
Data should be updated every [time interval]: are the data up-to-date?	/	/	[weekly] Up to date	15	[as needed] 10 months ago	15
Are the data openly licensed/in public domain?	/	/	Open license	20	Not known license	0
Are the data in open and machine-readable file formats?	/	/	De facto standard	20	View Only	0
Do government portals use social media tools?	Yes Mail, review		Yes Mail		Yes Mail, review	
Do governments have mobile applications for their data?	Not found		Not found		Yes Mobile Application Geosrbija—Digital platform	

Table A2. Summary of Administrative Boundaries data openness findings.

Indicator	Croatia		Slovenia		Serbia	
	Results	Final Score	Results	Final Score	Results	Final Score
Are the data collected by government (or a third-party related or linked to government)?	Yes	Yes	Yes	Yes	Yes	Yes
Are the data available online?	Data available as view only without restriction of access	7.5	Data available as involving service without restriction of access	15	Data available for download with registration	11.25
Are the data available free of charge?	Data available as view only free of charge	7.5	Data available as involving service free of charge	15	Data available for free of charge with registration	11.25
Where did you find the data?	NSDI metadata catalogue SGA Geoportal		SDII E-surveying Data		Metadata Geoportal Geosrbija	
Are the data downloadable at once?	Data for view only	0	Data downloadable at once without restriction	15	Data downloadable at once with registration/ authentication /identification	7.5
Data should be updated every [time interval]: are the data up-to-date?	[no info] /	0	[no info] A year ago Up to date	15	[no info] /	0
Are the data openly licensed/in public domain?	Not open license	0	Open license	20	Not known license	0
Are the data in open and machine-readable file formats?	View only	0	De facto standard	20	De facto standard	20
Do government portals use social media tools?	Yes Mail, review		Yes Mail		Yes Mail, review	
Do governments have mobile applications for their data?	Not found		Not found		Yes Mobile Application Geosrbija—Digital platform	

Table A3. Summary of Locations data openness findings.

Indicator	Croatia		Slovenia		Serbia	
	Results	Final Score	Results	Final Score	Results	Final Score
Are the data collected by government (or a third-party related or linked to government)?	Yes	Yes	Yes	Yes	Yes	Yes
Are the data available online?	Data available as view only without restriction of access	7.5	Data available for download with registration	11.25	Data available as view only without restriction of access	7.5
Are the data available free of charge?	Data available as view only free of charge	7.5	Data available for download free of charge with registration	11.25	Data available as view only free of charge	7.5
Where did you find the data?	NSDI metadata catalogue SGA Geoportal Hrvatska pošta		SDII E-surveying Data		Metadata Geoportal Geosrbija The Post of Serbia GIS	
Are the data downloadable at once?	Data for view only	0	Data downloadable at once with registration/ authentication/ identification	7.5	Data for view only	0
Data should be updated every [time interval]: are the data up-to-date?	[no info] Not up to date	0	[daily] Up to date	15	[no info] Not up to date	0
Are the data openly licensed/in public domain?	Not open license	0	Open license	20	Not open license	0
Are the data in open and machine-readable file formats?	View only	0	De facto standard	20	View only	0
Do governments' portals use social media tools?	Yes Mail, review		Yes Mail		Yes Mail, review	
Do governments have mobile applications for their data?	Not found		Not found		Not found	

Table A4. Summary of National Maps data openness findings.

Indicator	Croatia		Slovenia		Serbia	
	Results	Final Score	Results	Final Score	Results	Final Score
Are the data collected by government (or a third-party related or linked to government)?	Yes	Yes	Yes	Yes	Yes	Yes

Table A4. *Cont.*

Indicator	Croatia		Slovenia		Serbia	
	Results	Final Score	Results	Final Score	Results	Final Score
Are the data available online?	Data available as involving service (WMS) free of charge	15	Data available for download with registration	11.25	Data available as view only without restriction of access	7.5
Are the data available free of charge?	Data available as involving service (WMS) free of charge	15	Data available for download free of charge with registration	11.25	Data available as view only free of charge	7.5
Where did you find the data?	NSDI metadata catalogue SGA Geoportal		SDII E-surveying Data		Metadata Geoportal Geosrbija	
Are the data downloadable at once?	Data downloadable at once without restrictions	15	Data downloadable at once with registration	7.5	Data for view only	0
Data should be updated every [time interval]: are the data up-to-date?	[as needed] Up to date	15	[as needed] Up to date	15	[as needed] Up to date	15
Are the data openly licensed/in public domain?	Open license	20	Open license	20	Not known license	0
Are the data in open and machine-readable file formats?	Open format	20	Open format/De facto standard	20	View only	0
Do government portals use social media tools?	Yes Mail, review		Yes Mail		Yes Mail, review	
Do governments have mobile applications for their data?	Not found		Not found		Not found	

References

1. European Commission. *Digital Agenda: Commission's Open Data Strategy, Questions & Answers*; European Commission: Brussels, Belgium, 2011.
2. Attard, J.; Orlandi, F.; Scerri, S.; Auer, S. A systematic review of open government data initiatives. *Gov. Inform. Q.* **2015**, *32*, 399–418. [CrossRef]
3. Ibrahim, A.; Abdullah, S.D.; Arief, A. Benefits and Barriers of Open and One Government Data: A Systematic Review. In Proceedings of the Workshop on Environmental Science, Society, and Technology (WESTECH 2020), Makassar, Indonesia, 16–17 October 2020.
4. Janssen, M.; Charalabidis, Y.; Zuiderwijk, A. Benefits, Adoption Barriers and Myths of Open Data and Open Government. *Inform. Syst. Manag.* **2012**, *29*, 258–268. [CrossRef]
5. Kucera, J.; Chlapek, D. Benefits and Risks of Open Government Data. *J. Syst. Integr.* **2014**, *5*, 30–41. [CrossRef]
6. Martin, S.; Foulonneau, M.; Turki, S.; Ihadjadene, M. Open data: Barriers, risks and opportunities. In Proceedings of the 13th European Conference on eGovernment (ECEG2013), Varese, Italy, 13–14 June 2013.
7. van Loenen, B.; Vancauwenberghe, G.; Crompvoets, J.; Dalla Corte, L. Open Data Exposed. In *Open Data Exposed*, 1st ed.; van Loenen, B., Vancauwenberghe, G., Crompvoets, J., Eds.; T.M.C. Asser Press: The Hague, The Netherlands, 2018; Volume 30, pp. 1–10.
8. Welle Donker, F.; van Loenen, B. How to assess the success of the open data ecosystem? *Int. J. Digit. Earth* **2017**, *10*, 284–306. [CrossRef]
9. Zheng, L.; Kwok, W.M.; Aquaro, V.; Qi, X.; Lyu, W. Evaluating global open government data: Methods and status. In Proceedings of the 13th International Conference on Theory and Practice of Electronic Governance (ICEGOV20), Athens, Greece, 23–25 September 2020.

10. European Parliament; Council of the European Union. Directive (EU) 2019/1024 of the European Parliament and of the Council of 20 June 2019 on open data and the re-use of public sector information (recast). *Off. J. Eur. Union* **2019**, *L 172*, 1–28.

11. European Parliament; Council of the European Union. Commission Implementing Regulation (EU) 2023/138 of 21 December 2022 laying down a list of specific high-value datasets and the arrangements for their publication and re-use. *Off. J. Eur. Union* **2023**, *L 19*, 1–33.

12. Politika Otvorenih Podataka. Available online: https://rdd.gov.hr/UserDocsImages//SDURDD-dokumenti//POLITIKA%20OTVORENIH%20PODATAKA.pdf (accessed on 20 May 2023).

13. Global Open Data Index (GODI). Available online: https://index.okfn.org/place/ (accessed on 21 March 2022).

14. Open Data Barometer. Available online: https://opendatabarometer.org/?_year=2017&indicator=ODB (accessed on 21 March 2022).

15. Open Data Inventory. Available online: https://odin.opendatawatch.com/ (accessed on 21 March 2022).

16. OURdata Index. Available online: https://www.oecd.org/gov/digital-government/policy-paper-ourdata-index-2019.htm (accessed on 21 March 2022).

17. European Open Data Maturity Assessment. Available online: https://data.europa.eu/en/publications/open-data-maturity (accessed on 28 April 2023).

18. Lee, G.; Kwak, Y.H. Open government implementation model: A stage model for achieving increased public engagement. In Proceedings of the 12th Annual International Digital Government Research Conference: Digital Innovation in Challenging Times, College Park, MD, USA, 12 June 2011.

19. Seng, J.L.; Ko, I.F.; Lin, B. A generic construct based workload model for web search. *Inf. Process. Manag.* **2009**, *45*, 529–554. [CrossRef]

20. Sekhar, S.C. Benchmarking your way to a better practice. *Afr. J. Bus. Manag.* **2010**, *4*, 34–37.

21. Zuiderwijk, A.; Pirannejad, A.; Susha, I. Comparing open data benchmarks: Which metrics and methodologies determine countries' positions in the ranking lists? *Telem. Inform.* **2021**, *62*, 101634. [CrossRef]

22. Skargren, F. What is the point of benchmarking e-government? An integrative and critical literature review on the phenomenon of benchmarking e-government. *Inf. Polity* **2020**, *25*, 67–89. [CrossRef]

23. Maheshwari, D.; Janssen, M. Reconceptualizing measuring, benchmarking for improving interoperability in smart ecosystems: The effect of ubiquitous data and crowdsourcing. *Gov. Inf. Q.* **2014**, *31*, 1–9. [CrossRef]

24. Charalabidis, Y.; Zuiderwijk, A.; Alexopoulos, C.; Janssen, M.; Lampoltshammer, T.; Ferro, E. Open Data Evaluation Model. In *The World of Open Data: Concepts, Methods, Tools and Experiences*, 1st ed.; Charalabidis, Y., Zuiderwijk, A., Alexopoulos, C., Janssen, M., Lampoltshammer, T., Ferro, E., Eds.; Spinger International Publishing AG: Cham, Switzerland, 2018; Volume 28, pp. 137–172.

25. Geospatial High-Value Datasets. Available online: https://eurogeographics.org/news/high-value-datasets/ (accessed on 21 March 2022).

26. AlRushaid, M.W.; Saudagar, A.K.J. Measuring the Data Openness for the Open Data in Saudi Arabia e-Government—A Case Study. *Int. J. Adv. Comput. Sci. Appl.* **2016**, *7*, 113–122.

27. Open Knowledge Foundation. Available online: https://opendefinition.org/od/2.1/en/ (accessed on 21 March 2022).

28. Worldometer Population Statistics. Available online: https://www.worldometers.info/population/countries-in-europe-by-population/ (accessed on 23 March 2022).

29. World Bank Indicators. Available online: https://data.worldbank.org/indicator/NY.GDP.PCAP.PP.CD?locations=Z7 (accessed on 23 March 2022).

30. Huyer, E.; van Knippenberg, L. *The Economic Impact of Open Data: Opportunities for Value Creation in Europe*; European Data Portal: Brussels, Belgium, 2020; pp. 1–138.

31. Vickery, G. *Review of Recent Studies on PSI Reuse and Related Market Developments*; Information Economics: Paris, France, 2011; pp. 1–44.

32. National Spatial Data Infrastructure (NSDI) Metadata Catalogue. Available online: https://geoportal.nipp.hr/ (accessed on 30 March 2022).

33. State Geodetic Administration (SGA) Geoportal. Available online: https://geoportal.dgu.hr/ (accessed on 30 March 2022).

34. Croatia Land Register. Available online: https://oss.uredjenazemlja.hr/public/lrServices.jsp?action=publicLdbExtract (accessed on 5 April 2022).

35. Hrvatska Pošta. Available online: https://www.posta.hr/ (accessed on 4 April 2022).

36. E-Surveying Data Slovenia. Available online: https://egp.gu.gov.si/egp/ (accessed on 30 March 2022).

37. Spatial Data Information Infrastructure. Available online: http://www.geoportal.gov.si/eng/ (accessed on 30 March 2022).

38. Real Estate Mass Evaluation Portal Slovenia. Available online: http://prostor3.gov.si/ETN-JV/ (accessed on 5 April 2022).

39. Metadata Geoportal Serbia. Available online: https://metakatalog.geosrbija.rs/geonetwork (accessed on 30 March 2022).

40. Geosrbija Geoportal. Available online: https://a3.geosrbija.rs/ (accessed on 30 March 2022).

41. Real Estate Price Register Serbia. Available online: https://katastar.rgz.gov.rs/RegistarCenaNepokretnosti/ (accessed on 1 April 2022).

42. eCatastre Serbia. Available online: https://katastar.rgz.gov.rs/eKatastarPublic (accessed on 5 April 2022).

43. Geosrbija—Open Data Portal. Available online: https://opendata.geosrbija.rs (accessed on 5 April 2022).

44. The Post of Serbia GIS. Available online: http://www.postagis.rs/ (accessed on 4 April 2022).

45. Croatia Territorial Organisation. Available online: http://www.propisi.hr/print.php?id=5006 (accessed on 30 March 2022).
46. Serbia Territorial Organisation. Available online: https://www.paragraf.rs/propisi/zakon_o_teritorijalnoj_organizaciji_republike_srbije.html (accessed on 30 March 2022).
47. Slovenia Territorial Organization. Available online: http://www.us-rs.si/legal-basis/constitution/?lang=en (accessed on 30 March 2022).