

# Status of Open Data (Sub)Ecosystem in Croatia: National Open Data Portal

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**Abstract** - The main purpose of this paper is to assess the state of open data (sub)ecosystem in Croatia via application of open data assessment framework developed within the Horizon 2020 TODO (Twinning Open Data Operational) project. TODO assessment framework consists of four main areas - governance, availability, portal and impacts. We have applied assessment framework to Open Data Portal of the Republic of Croatia and institutional data as a selected category of open data. The results of analysis have shown that there is a lot of potential for improvements in all analyzed aspects, although most important formal requirements and technical features are in place.

**Keywords** – open data (sub)ecosystem; institutional data; TODO project; assessment framework; national open data portal; Croatia

## I. INTRODUCTION

Open data are one of the most salient developments in the area of e-government and e-participation. The availability of data to everyone in an open and machine-readable form, free of charge represents a specific mechanism for achieving government transparency, which goes much further in accomplishing the values of open government than the traditional transparency (access to information, whatever the form). The reuse of open data for commercial or noncommercial purposes also promotes participatory government [1], since the users (i.e. the public – individuals, civil society organizations (CSO), private businesses, media etc.) constitute a critical element in generating the final outcome of the data (re)use - different applications, sophisticated business product based on open data (such as legal information portals, business portals), scientific research and analyses, etc.

Although the literature advocates several potential advantages of open data, which can basically be divided into democratic and economic benefits, their implementation in practice has been difficult to measure. While the impacts of open data may be challenging to evaluate, different assessment frameworks capturing one or more aspects of open data initiatives (such as data quality, availability, legal context etc.) have been developed and widely applied worldwide during the past decade. While the results of such assessments can be useful in formulating and modifying national open data policies, as well as in knowledge transfer and good practice exchange between the countries, they are characterized by some serious shortcomings, both conceptual and methodological.

The main purpose of this paper is to assess the state of open data in Croatia via application of the assessment framework developed during the Online Training Program (OTP) of Horizon 2020 TODO (Twinning Open Data Operational) project, and to discuss the usefulness of such evaluations based on the interpretation of the assessment results. The TODO assessment framework is applied to Croatian open data sectoral subsystem – institutional data, which is provided within central open data Portal.

## II. OPEN DATA EVALUATIONS

### A. Existing models for assessment

During the last two decades, open data has strongly been advocated, especially at the international level by different actors (CSO, IT experts, businesses) and organizations (OECD, UN, WB). While the main goal behind the open data initiatives lies in increasing democratic potential of government and acquiring economic benefits, up until today it is not clear to what extent have those aims been achieved in specific countries [2]. While such wide-range effects of open data may be very difficult to capture, there is a number of evaluation frameworks encompassing different aspects of open data initiatives. Since open data is still relatively young phenomenon within e-government development, evaluation is needed as a benchmarking tool in comparisons of different countries or organizations, as well as a means for monitoring the progress of open data initiatives and formulating new open data policies [4]. As stressed by Susha et al. [5], they can “give credible insight into the strengths and weaknesses of a particular country and thus serve as powerful incentives for further improvements.”

Different assessment frameworks that have been developed during the past decade can be differentiated according to open data area they assess or the type of metrics methodology they use. Open data assessments can be based on the area (i.e. aspect) of assessment - open data readiness assessments, open data implementation assessments and open data impact assessments [4]. Ref. [6] elaborates the difference between the evaluation models starting from the type of research method. While subjective models focus on users' opinion and perceptions of open data aspect (such as benefits, usefulness and other), objective models use „predefined metrics and values of them towards the assessment of specific benchmarks regarding the evaluated aspect (e.g. impact and readiness assessment)“. Therefore, objective evaluation models are based on quantitative research

methods, while subjective models can use both qualitative (open questions) and quantitative (Likert scale) methods, or a combination of both types.

Based on the existing information systems research, Charalabidis et al. [6] identify eight relevant subjective streams, four of which pertain to the category of quantitative models (information systems evaluation, information systems acceptance, information systems success and e-services evaluation) and four of them characterized by either qualitative or quantitative research methods (maturity assessment, readiness assessment, post adoption and impact assessment). Subjective quantitative evaluation aims at obtaining users' opinion about different aspects of their user experience, such as perceived usefulness, user-friendliness, future behavior, etc.), assessed on the five or seven-point Likert-scale. Within the second category of subjective evaluation methods, which can be both qualitative or quantitative, maturity models are preoccupied with the ability of an organization or a country for an improvement, which is commonly conceptualized through different stages or phases. Readiness assessments focus on organizational factors acting as an enabler or barrier to opening the data. Post adoption assessments deal with issues of acceptance, routinization, and assimilation of open data, while impact assessments are aimed at measuring the impact of open data at different levels (macro – effect on the society and economy, meso – impact on the specific sector, and micro – effects of specific datasets usage). Objective Evaluation Models rely on specific quantitative measures according to which different aspects of open data can be assessed, for example data quality, popularity of datasets and similar. Examples include indexes such as Open Knowledge Foundation, Open Data Barometer, and many others [6].

Alongside potential benefits of such assessment frameworks, the literature has also identified several limitations, both conceptual and methodological nature. With open data still being young research area, some concepts may be differently understood and defined, with varying indicators (for example, data quality). Assessment frameworks, as well as open data initiatives themselves, have been developed by different actors, with different points of departure and purposes, which is why they are very context specific and most useful when applied in specific situation. Since particular assessment frameworks differ in their scope and focus, as well as methodology, they can result with varying country ranks [5]. Evaluation of open data usually takes form of benchmarks, which in general suffer from the problem of shallowness, often with scarce benchmarks and inability to measure the progress [5]. They rather capture an immediate snapshot of the phenomenon instead of the real, wider picture. Therefore, future research should encompass „more in-depth and focused look at what else can be learnt from open data benchmarks“ [5]. Finally, the existing evaluation frameworks largely focus on data supply and data environment, neglecting the user perspective [2], which is also an important shortcoming.

One of the most relevant open data benchmarks in Europe is *Open Data Maturity Report* [3], published annually by the European Commission and assessing open

data maturity in four dimensions – policy, portals, impact and quality. Countries are placed within four categories according to their score: ‘trend-setters’, ‘fast-trackers’, ‘followers’ and ‘beginners’. In latest, 2022 Report, eight countries scored best as ‘trend-setters’: France, Ukraine, Poland, Ireland, Cyprus, Estonia, Spain and Italy. In 2021, the category of best performing countries included France, Ireland, Spain, Poland, Estonia and Ukraine. Malta and Slovakia are examples of countries remaining at the bottom of the list for the past several years, while some countries have shown a remarkable growth between reporting period, such as Hungary in 2022 and Ukraine in 2021. In general, countries score better in policy and portal dimension, in comparison to quality and, especially, impact dimension.

Croatia has been placed slightly above the EU average in the last few cycles of the Report, with a continuous increase of open data maturity until 2021. In 2019, Croatia scored 69% (EU average 66%), in 2020 - 82% (EU average 78%), and in 2021 – 84% (EU average 81%). In 2022, Croatian score decreased to 72%, compared to EU average of 79%. However, Croatia remained within the category of ‘followers’ (alongside Austria, Belgium, Bulgaria, Croatia, Finland, Germany, Hungary, Luxembourg, the Netherlands, Portugal, Romania, Sweden, Switzerland and Serbia) as it was placed in 2021, together with Finland, Sweden, Greece, Bulgaria, Latvia, Romania and Czech Republic. In 2020, Croatia was among the ‘fast-trackers’, alongside the Netherlands, Greece, Finland, Germany and others [3].

#### B. *TODO OTP Assessment framework*

Within the project "TODO – Twinning Open Data Operational" [7], a Horizon2020 Twinning project, an online training program has been developed and implemented covering the fundamental and more advanced areas of open data research and practice. Online training program consists of three modules. First module involves an introduction to open data, focusing on individual lectures and quizzes on basic concepts of open data and open data ecosystem. Second module - assessing open data – includes the development of conceptual-methodological framework for the analysis of open data on Croatia, which was performed by interdisciplinary groups from different faculties of the University of Zagreb and their supervisors from Delft University of Technology (the Netherlands) and University of the Aegean Greece). Final, third module - Open Data in Croatia – focuses on practical application of the previously developed framework on the Croatian open data ecosystem or its part (subsystem).

Open data assessment framework developed as a result of interdisciplinary team work within the second module is a subjective, combined (mostly quantitative) assessment framework, aimed at assessing national open data ecosystem or its part, such as specific sector or level of government. The questionnaire mostly comprises multiple choice questions or ranking option (close-ended questions), but it also includes few open-ended questions reflecting the estimation or interpretation of the evaluator. Therefore, the assessment framework can be categorized

as subjective assessment framework mostly relying on quantitative research measures, with some quantitative measures. The questionnaire encompasses 53 questions in total, which are divided into four thematic areas. *Open Data Governance* is covering issues of open data policy (questions 2-7), which corresponds the characteristics of open data maturity and readiness assessments. Second part, *Open Data Availability*, comprises questions related to legal aspects of open data (questions 8-23), while technical aspects are covered in third part of the assessment - *Open Data Portals* (questions 24-41). Final part of the framework, *Open Data Impact*, contains questions on initial impacts of open data at meso and macro level as well as some questions related to the user perspective (questions 42-53).

In this paper, the TODO OTP Open data assessment framework is applied on the Croatian National Open Data Portal (*Portal otvorenih podataka*) [8], which contains different institutional data. Since Open Data Portal is one of the thematic areas within the assessment framework, including set of questions referring to the Open Data Portal itself, we opted to analyse institutional data as a specific (sectoral) open data subsystem. Therefore, within the sections on Open Data Governance and Open Data Availability we refer to the domain of institutional data as an Open Data ecosystem, while in the section Open Data Portals, the Croatian Open Data Portal was assessed specifically. Each area of assessment – governance, availability, portals, impacts - is briefly described according to the indicators of TODO assessment framework.

Institutional data represents a separate category of open data, together with political and public administration data, including data on organisational and functional aspects of political and administrative organisations and other public sector bodies at different levels of government (state, local, regional). Examples of such data would include data on election results, electoral constituencies, campaign financing, public officials, list of public sector bodies, register of national minorities' councils, schedule of government meetings and similar [8].

TABLE 1. Areas of the TODO OTP Open Data Assessment framework

| <b>OPEN DATA GOVERNANCE</b> | <b>OPEN DATA AVAILABILITY</b>                       | <b>OPEN DATA PORTALS</b>  | <b>OPEN DATA IMPACTS</b>   |
|-----------------------------|---|---|--|
| <i>Policies Strategies</i>  | <i>Legal aspects – licenses, fees, registration</i> | <i>Technical aspects – formats, functionality, metadata, web statistics</i> | <i>Initial socio-economic effects</i><br><br><i>User perspective</i> |

### III. APPLICATION OF THE TODO OTP ASSESSMENT FRAMEWORK ON CROATIAN OPEN DATA (SUB)ECOSYSTEM

#### A. The state of open data in Croatia

Open data policy was formally lately adopted in Croatia – in 2018, although the open data have been

introduced in 2013 by the Law on the Right to Access Information (LRAI) [10] as part of the systemic regulation of the right to access information. In some sectoral areas (for example, geodata) open data existed earlier. Legal obligation to publish open data and accompanying requirements are stipulated by the Law on the Right to Access Information, which transposes the PSI Directive. The Law requires that each public body has to ensure that data is made public on the internet whenever it is possible, in machine readable formats (CSV, XLS, XML, JSON, HTM). Open data is available at the Open Data Portal of the Republic of Croatia, which represents central Portal for assembling and (re)use of public sector open data. The Portal was established in 2015 by the Ministry of Public Administration, and with the support of Croatian Regulatory Authority for Network Industries and Omega software firm. In technical terms, a combination of two systems was used (Drupal and CKAN), modelled after the British Open Data Portal ([Data.gov.uk To Go](http://Data.gov.uk)). The new and upgraded Open Data Portal is now run by the Central Office for the Development of Digital Society. It contains around 2.143 datasets. Alongside Open data portal, open data is available on public bodies' official websites and some specialized portals (such as environment, geodata, statistics, etc.) [10]. The Open Data Portal is linked to the European Open Data Portal thus adding to the European wide pool of data open for the reuse.

Local governments have been largely lagging behind in making available their open data when compared to national. Although subject of the requirements of the LRAI, majority of local units are failing to publish data and information in machine-readable formats. Currently, four local units have established open data portals (Zagreb, Rijeka, Virovitica, Varaždin), with several other cities and municipalities offering some registers and other information in open formats. However, the number of such datasets is low, and most commonly accessible in excel file. Front-runners are City of Zagreb, with Portal established in 2015 and 129 datasets, and the City of Rijeka (Portal introduced in 2016, with 182 datasets currently). The quality of the portals datasets is around the level 2 or 3 (out of 5), encompassing areas of education and health, business and tourism, environment, energy, transport, public finances, infrastructure, institutional and statistical data, etc.

#### B. Open Data Governance: Policies and strategies

There is a formal Open data policy in Croatia (*Politika otvorenih podataka*) [12]. It was adopted on July 19th 2018 by the Croatian Government as a strategic direction for further development of the transparency and openness of public administration. The policy applies to all public authorities at national, regional and local level, i.e. government organizations, local and regional government, agencies and other bodies with public authorities. Although it is not specified to which bodies it applies, it can be assumed that Open Data Policy applies to all public authorities, as it appears from the provisions of the Law on the Right to Access Information (LRAI). The adoption of the policy was stimulated by the European PSI Directive, as well as the EU benchmarking report on the Open Data Maturity, showing no formal policy nor strategy was adopted during the 2017. With regard to the

scope of government datasets that Open data policy aims to make available, it comprises all public bodies (national as well as local), which are according to the provisions of the LRAI obliged to publicise, in principle, all data except those exempted by the law (personal data, classified information, and similar).

Open data policy envisages that the Action Plan has to be adopted (by the Council for State Information Infrastructure, a Government body). However, no formal strategy on open data nor Action plan has been adopted yet (Action plan is in the process of drafting). However, there are initiatives and institutions promoting open data policy. Open Government Partnership Action Plans in Croatia (both for the period 2017-2020 and 2022-2023) envisaged continuous progress in opening data as one of the measures of openness policy with main purpose to increase the amount of open data and promote the reuse of data [13].

Government organization responsible for the coordination of Open data policy in Croatia is Central government office for the development of digital society. Government Office provides support to the Croatian Government in the development of digital infrastructure and digital public services, and it promotes further development of digital society in different aspects (economy, public sector, citizens) in accordance with the EU policy on digital economy and society [14].

In addition, the Government has established in 2018 Coordination for ODP actions implementation, which is comprised of 8 members - two representatives of the Central government office, two representatives of Information Commissioner, two representatives of Ministry of Administration and two representatives of Central government office for civil society. The responsibilities of the Coordination include drafting of an Action Plan and monitoring its implementation. However, in formulation and coordination of open data policy are involved other government/public authorities, such as Information Commissioner who had very important role in fostering the adoption of the policy as well as Government Office for Civil Society.

Therefore, open data policy is largely fragmented and lacks strong institutional steering mechanism, as well as vivid political will, since the majority of policy achievements have been accomplished so far due to personal efforts of individual leaders of involved institutions and not due to unambiguous and continuous government (institutional) support.

### C. Open Data Availability

For the purpose of assessing the aspect of open data availability, we analysed two datasets. First one is a register of public authorities, which is a database provided by Information Commissioner and is available at its official website (<http://tjv.pristupinfo.hr/>). Database is also available at the Open Data Portal, as well as by using generic search terms, placed as the first results of the search. In addition, it is available at some other, non-government platforms [15].

Dataset is accessible without prior registration and entirely free of charge. Dataset is published in national open licence (*Otvorena dozvola RH*), which is by a content equivalent to CC-BY licence, i.e. the user has to indicate the source or link where the information is available [16].

The second analysed dataset was National census – population by territorial units (last census from 2021) [17]. The dataset is findable using generic search terms, and also available at the website of the Croatian Bureau of Statistics which is the provider of the dataset [18], alongside the Open Data Portal. Registration is not required, i.e. anyone can access the dataset without prior registration. Dataset is also available free of charge. Dataset is published under national Open data licence which requires the indication of the source of the information by the user. In comparison to first dataset (database of public authorities), second dataset (National census) was somewhat harder to find, due to large number of similar datasets. In addition, the newest dataset with population census of 2021 has been published as open data only recently, due to data processing after conducting a census.

The analysis of two selected datasets (*Database of public authorities* and *National census*) showed high level of open data availability. Both datasets are in general easy findable, free of charge, without registration and published under national open licence. However, this does not have to be the case with some other datasets available at the Portal, and the analysis results of two datasets cannot be generalized to other institutional data.

### D. Open Data Portal

Within the third part of the assessment, Open data portal of the Republic of Croatia (*Portal otvorenih podataka RH*) was analysed in general. The national open data portal is envisaged to serve as a data hub for the collection, categorisation and distribution of open public sector data. The portal represents a type of metadata catalogue that enables easier searching of open data. The Portal harvests datasets from local open data portals as well.

With regard to Berners-Lee categorization, the level of datasets mostly includes a mix of star levels, mostly 2 to 3 stars. Out of 2.148 datasets, formats used comprise: XLSX (492), CSV (384), XLS (372), HTML (238), XML (113), aspx (66), PDF (406), WMS (22), JSON (45), KML (45) SHP (45). With regard to search functionality, it is possible to alter option for topic, publisher, format, stars and the frequency of data update, and to sort the results by the importance, title, last updated and openness of the dataset. Option for advanced search offers opting for a preferred period of data publishing and the period of last update. Open data are mostly available via download service, although other services are available as well (a discovery service, a viewing service, e.g. web mapping service, an API, a request form). A preview function before downloading is also available. There are no download options for available datasets, only a single button with which dataset can only be downloaded as one complete file.

Metadata is in principle documented adhering to a metadata standard (e.g. ISO 19115, DCAT). Up until now, metadata is available in national language only. With regard to its completeness, there are missing metadata fields, although most important data are listed. Data provenance / data source(s) are clearly listed in metadata. Actuality of the datasets is clear, but only actual version according to update date is listed in metadata (with no specification of last update). Static datasets are updated, but not most frequently, while dynamic datasets are in near real-time (slight delay) although dataset is still useful for (near) real-time applications (being refreshed).

At the Open Data Portal there is an area to showcase most popular datasets and their applications, but only older applications are shown (not updated for over one year). Feedback options have been improved with introducing a new Portal, with separate section 'Your suggestions' including options to make a proposal for new dataset, advancement of an existing dataset or suggestion for a correction. There is also a section for comments and questions. There is a possibility to subscribe to RSS feed re update notifications and an option to send message to data provider directly (each dataset lists a contact). Other media for interaction (e.g. special social media for the Portal) are not in place, and Portal does not include an option to upload datasets.

The new Portal also introduced web statistics at the Portal, including the number of visits, downloads, published datasets per months, number of suggestions for advancements of datasets and for new datasets, and whether they have been addressed. Some web statistics has also been contained in the Reports of the Information Commissioner which has closely been cooperating with the Government Office on the open data issues. Having in mind all the mentioned technical characteristics of the Portal, its overall user-friendliness can be assessed as medium to high, since some options are lacking or could be improved – metadata language, updating, feedback options.

#### E. Open Data Impact

The final part of the assessment framework included section on the impact of open data. For the open data ecosystem, we have analysed – institutional data, scientific studies or reports published showing its (potential) economic or societal benefits have not been published yet. For example, the applications that are using open data are not reported on the Portal (last application reported in 2017). However, there are some activities aimed at promoting open data (re)use, such as hackathons (both national and local) and workshops and conferences on open data organized by universities (mostly University of Zagreb). The role of the academia is in that respect most relevant. Events promoting open data are also organized by government organizations, mostly by Central government office for the development of digital society and Information Commissioner, but are primarily focused on civil/public servants' education on open data (webinars, workshops, trainings). Surveys among (potential) open data users within the institutional data ecosystem have not been carried out yet, to our knowledge.

Hence, with respect to open data impact, it can be argued that different types of impact – societal, economic, or other – have not been extensively assessed yet. However, some effects and possible impacts are addressed in scientific studies and papers, largely produced by TODO consortium members. This research derives from different scientific disciplines and areas of open data usage (geospatial, transport, agricultural, legal), including interdisciplinary studies [19]. Level of user inclusion (as well as the assessment of open data re-use and users) remains rather low, with activities still primarily aimed at open data promotion and raising awareness.

#### IV. CONCLUSION

The application of the TODO assessment framework on institutional data as part of Croatian open data ecosystem has shown some interesting insights but has primarily pointed at wide area for improvements. First, following its formal introduction, Open Data Policy has remained in its beginnings, with important regulations still missing (strategy, action plan). Policy itself is fragmented within different strategic documents and acts referring to related issues. The coordination of open data policy is also rather fragmented and could be improved by systemic steering as well political commitment. Second, availability of analyzed datasets was assessed rather high, with most of technical requirements for open data in place (findability, charges, registration, licenses). Third, the assessment of the Open Data Portal in whole showed medium to high level of user-friendliness, with some deficiencies. Evaluation of open data impact is probably the most problematic aspect of the assessment, since comprehensive and in-depth impact assessments are still lacking. There are few scientific and other types of studies and reports focusing on different aspects of open data effects, which have emerged as a result of HORIZON2020 TODO project. Finally, the assessment framework pointed out some peculiarities of the national open data availability features, but the usefulness of such an approach could be significantly improved by a comparative approach which could explain some of the differences and similarities between specific countries' status of open data. Nevertheless, the project has significant role in informing and promoting open data (re)use and its benefits, primarily within the academia and public sector organizations in Croatia. What is still needed is raising awareness on the user side as well (different categories of potential users, general public).

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