The State of the Art of Open Government Data-Driven Co-Creation in the Slovenian Context

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Abstract

The paper explores the current state of play regarding the use of Open Government Data (OGD) in Slovenia. Slovenia ranks highly on international benchmarks, largely due to the existence of a solid normative framework, an established institutional infrastructure, and the overall high quality of published OGD. However, the key challenge lies in the limited impact of these datasets in generating social innovation, public value, and economic development. The paper therefore focuses on mapping the actual (re)use of OGD within the Slovenian public administration context. Particular attention is paid to identifying instances of OGD use that are embedded in co-creative practices involving public, private, and civil society actors.

Hence, the study aims to answer the following research questions:

RQ1: What types of applications based on Open (Government) Data exist within the Slovenian context?

RQ2: How are these applications distributed across different policy areas?

RQ3: To what extent are public institutions involved in their development?

RQ4: To what extent do these OGD-based applications incorporate co-creation principles?

Methodologically, the paper relies on qualitative desktop analysis. The empirical material includes official repositories and presentations of OGD-based applications (e.g. the national OGD portal OPSI), international reports and rankings, as well as additional cases identified through secondary research. The analysis focuses on mapping OGD applications according to the year of their development, their current (non)functionality, the policy areas they address, the degree of public sector involvement, and the presence of co-creation principles.

The findings indicate that OGD reuse in Slovenia is unevenly distributed across policy areas and strongly embedded in institutional contexts, with public organisations frequently acting as active partners rather than mere data providers. At the same time, co-creation remains a limited and non-dominant approach, and most applications rely on combining OGD with other types of data.

The introduction first provides a conceptual and theoretical framing of OGD-driven co-creation and positions Slovenia within the broader European and global OGD landscape. The results section presents the empirical findings and highlights patterns of OGD reuse across different domains. The last chapter revisits the research questions in light of these findings and reflects on how Slovenia's administrative context and public administration capacity shape the observed outcomes.

This research is conducted within the framework of the project Open-Ready – An Evidence-Based Model for the Assessment of Organisational Maturity for Open Government Data: A Precondition for Data-Driven Co-Creation (J5-50166). The study thus serves as a foundational step for in-depth qualitative research on selected public organisations (beyond the scope of this paper), which in turn aims to provide the basis for developing a model to assess organisational maturity in OGD-driven co-creation and contributes to a more systematic understanding of OGD reuse and co-creation in a national administrative context.

1 Introduction

Open government data (OGD) has long been associated with the promise of generating economic value, improving societal well-being, and strengthening democratic governance. Yet, the mere publication of data does not in itself realise these expected benefits. As a result, both international organisations such as the EU and OECD and academic scholarship have gradually shifted attention away from data publication alone toward questions of data reuse, impact, and collaboration. Within this broader shift, two closely related concepts have gained prominence: demand-driven open data and OGD-driven co-creation.

The concept of demand-driven open data promotes a move away from releasing datasets primarily on the basis of internal administrative priorities and convenience, toward a more strategic approach that prioritises high-quality datasets with the greatest relevance and demand among users (Köster & Suarez, 2016). While this perspective reorients the process of data publication beyond a supply-led logic, it still focuses primarily on what data should be released. By contrast, the concept of OGD-driven co-creation addresses the question of how data can be mobilised and used in practice to generate public value. OGD-driven co-creation refers to collaborative processes in which public institutions, private actors, civil society organisations, and citizens jointly use data to address societal, political, or economic problems and to develop solutions that may be more responsive and innovative than those produced through traditional models of policy-making and service delivery (McBride, Aavik, et al., 2019a; Toots et al., 2017).

Although the literature has lately engaged with the relationship between OGD and co-creation, existing research remains heavily shaped by the study of individual cases, often at the service level. This reliance on empirical case-study approaches reflects the relative novelty and still limited development of the field (Callinan et al., 2018). Much of the current knowledge is based on small-scale, localised pilots and illustrative examples, such as urban app development in Bilbao, co-creation pilots in Rotterdam, or "walking workshops" aimed at designing services for older adults in Bremen (Callinan et al., 2018; Jarke, 2019). In a context marked by a "general lack of real-world examples," single high-profile cases have often served as the basis for early conceptualisation and theory-building (McBride, Aavik, et al., 2019b). One frequently cited example is the Chicago food safety inspection forecasting model, which has become a reference point in discussions of OGD-driven co-created public services (Cubuk et al., 2019; McBride, Aavik, et al., 2019b). Moreover, research focused on specific national settings—such as Estonia, Brazil, or Finland—to identify drivers and barriers of OGD-based innovation (McBride et al., 2020; Nikiforova & McBride, 2021; Wiedenhöft et al., 2023).

This case-oriented literature has generated valuable insight into the internal dynamics, enabling conditions, and challenges of OGD-driven co-creation. At the same time, however, it has also produced a fragmented understanding of the phenomenon. As noted in the broader OGD literature, the field has evolved from an initial emphasis on technical and legal aspects of data publication toward a second phase focused on the evaluation of individual initiatives and the identification of their benefits and barriers (Gao et al., 2023). Yet, while such studies are useful for understanding the "inner workings" of OGD-driven co-creation, their findings often remain difficult to generalise beyond the specific cases in which they emerged (McBride, Toots, et al., 2019). Consequently, there is a growing need to move beyond isolated examples and to examine whether OGD-driven co-creation is present more broadly as an emerging mode of governance and public problem-solving within particular national contexts.

This raises an important analytical question: to what extent are OGD-driven co-creation initiatives actually present within a given country, and do they represent isolated experiments or a broader and more durable pattern of governance innovation? Addressing this question requires shifting the focus from exceptional flagship cases toward a more systematic mapping of OGD-based applications and their characteristics. Such an approach makes it possible to assess not only whether data is being reused, but also whether this reuse is embedded in more collaborative, cross-sectoral, and co-creative forms of action.

This paper addresses that question by examining the state of the art of OGD-driven co-creation in Slovenia. Slovenia represents a particularly relevant case for such an inquiry. On the one hand, Central and Eastern European (CEE) countries remain comparatively underrepresented in the literature on OGD-driven co-creation. On the other hand, Slovenia is widely recognised—both regionally and internationally—as a comparatively strong performer in the implementation of OGD policy.

Over the past decade, Slovenia has undergone a significant transformation in its OGD landscape, moving from a relatively early-stage environment toward a position of strong international performance. In the mid-2010s, Slovenia was characterised by limited systematic policy development and a national data portal that provided basic accessibility but lacked the breadth and maturity observed in more advanced OGD ecosystems (OECD, 2015). At that stage, Slovenia was positioned in the lower tiers of major international benchmark assessments (Publications Office of the European Union. et al., 2020a, 2020b). However, between 2017 and 2020, the country made substantial progress, improving its performance in both the OECD OURdata Index and the European Open Data Maturity assessments (OECD, 2021; Publications Office of the European Union. & Capgemini Invent., 2020). More recent reports continue to position Slovenia among the better-performing European countries, particularly in the policy and governance dimensions of OGD maturity (Publications Office of the European Union., 2023; Publications Office of the European Union et al., 2025).

At the same time, these benchmark improvements mainly capture the maturity of the enabling environment—such as legal frameworks, portal management, metadata quality, and institutional coordination—rather than the actual depth, distribution, and co-creative character of OGD reuse in practice. Indeed, recent assessments continue to stress the importance of moving "from traction to impact" by shifting attention from publication toward active stimulation, measurement, and support of data reuse (Publications Office of the European Union et al., 2025). In this sense, Slovenia presents an analytically productive case: it offers a comparatively favourable institutional setting for OGD-driven co-creation, while still leaving open the question of whether such enabling conditions have translated into a more vibrant and collaborative ecosystem of OGD reuse.

Against this background, the paper aims to examine whether Slovenia's comparatively advanced OGD framework is associated with a broader ecology of OGD-based applications and, more specifically, to what extent these applications reflect the principles of co-creation. Rather than focusing on a single flagship case, the paper provides a broader mapping of OGD-based applications in Slovenia and analyses them in terms of their policy distribution, actor constellations, and co-creative characteristics. In doing so, it contributes to the literature by moving beyond isolated examples and by exploring the empirical extent to which OGD-driven co-creation is present within a national administrative context.

To achieve this, the paper is guided by the following research questions:

RQ1: What types of applications based on Open (Government) Data exist within the Slovenian context?

RQ2: How are these applications distributed across different policy areas?

RQ3: To what extent are state institutions involved in the development of these applications?

RQ4: To what extent do these OGD-based applications build upon co-creation principles?

Following this introductory chapter, the second chapter presents the methodology of the research. The third chapter discusses the results, while the final chapter highlights the main trends emerging from the Slovenian case and outlines the limitations of the study.

2 Methodology

The paper employs a qualitative desktop research design to examine the current state of open data-based applications in Slovenia and to assess the extent to which these applications incorporate co-creation principles. The research was conducted in May 2025. The empirical material was drawn from three main sources: the list of applications published on the Slovenian national open data portal OPSI; the EU Open Data Maturity Reports covering the period 2015–2024; and the OECD OURdata Index reports for 2013, 2017, 2019, and 2023. In addition, further applications were identified through supplementary secondary online searches and included in the final corpus of cases.

Applications were included if they represented a recognisable instance of data reuse in the form of a digital tool, platform, portal, or service drawing on open government data, open data, or other forms of publicly accessible information. For this reason, the paper uses the notation O(G)D throughout. This broader formulation reflects the fact that some of the identified applications are based specifically on open government data (OGD), while others rely on a combination of government and open data (OD), or on forms of public information that are openly accessible but do not fully meet the stricter technical and legal standards associated with open data today.

This distinction is particularly important given the longitudinal scope of the analysis, which covers the period from 2005 to 2024. Over this period, both the policy understanding and the technical definition of open data have evolved considerably. As a result, some applications included in the study rely on data resources that, while considered legitimate forms of openness or reuse at the time of their emergence, may not fully satisfy contemporary expectations regarding machine-readability, interoperability, or licensing. The use of the term O(G)D therefore allows for a more historically and empirically grounded analysis of the Slovenian data reuse ecosystem.

In order to address the research questions, a coding template was developed to support the systematic collection and comparison of information across identified cases. The coding process relied on official application websites, portal descriptions, and the relevant international reports, together with other publicly available supporting materials where necessary. The template included the following categories: year of development,[1] current operational status (functional or non-functional), policy area, involvement of public sector organisations, type of data used, and

[1] When the year of development was not available, we coded the year of the document in which the application was first recorded.

the extent to which co-creation principles were reflected in the application's development and/or operation.

The analysis is primarily descriptive and exploratory. Rather than evaluating the success or impact of individual applications, it seeks to map the breadth of O(G)D reuse in Slovenia and to identify broader patterns regarding sectoral distribution, forms of public sector involvement, types of data reuse, and the presence of co-creative practices.

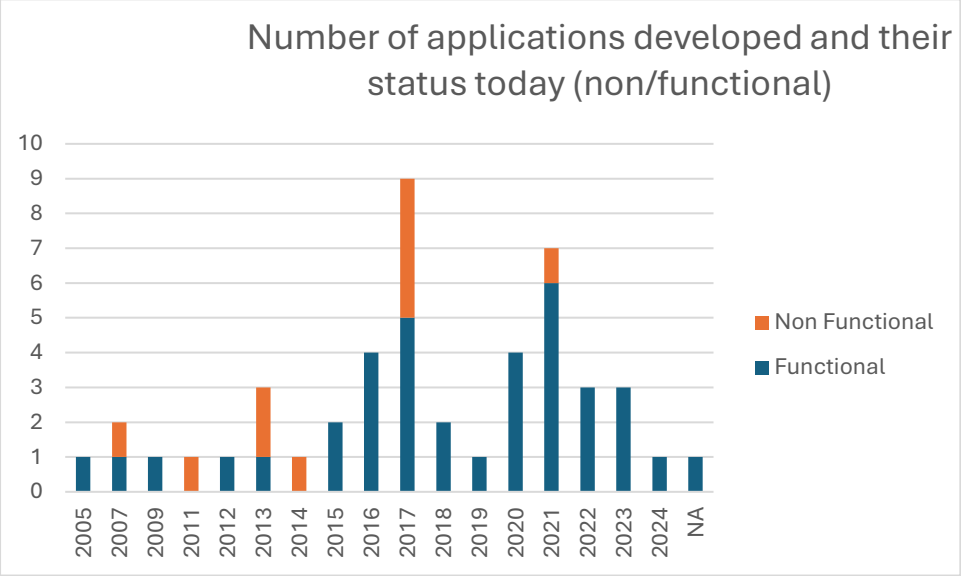
3 Results

The results are presented in four subsections. The first three parts examine applications based on the (re)use of O(G)D, including cases that do not necessarily involve co-creation. The final subsection (3.4) zooms into applications that build specifically on OGD-driven co-creation.

3.1 Temporal development and functionality of applications building on O(G)D in Slovenia

We identified total of 47 applications developed between 2005 and 2024 that build upon O(G)D. Of these, 10 are no longer functional. Figure 1 illustrates the number of O(G)D-based applications developed per year, along with their operational status at the time the research was carried out.

Figure 1: Number of applications per year and status (non/functional)

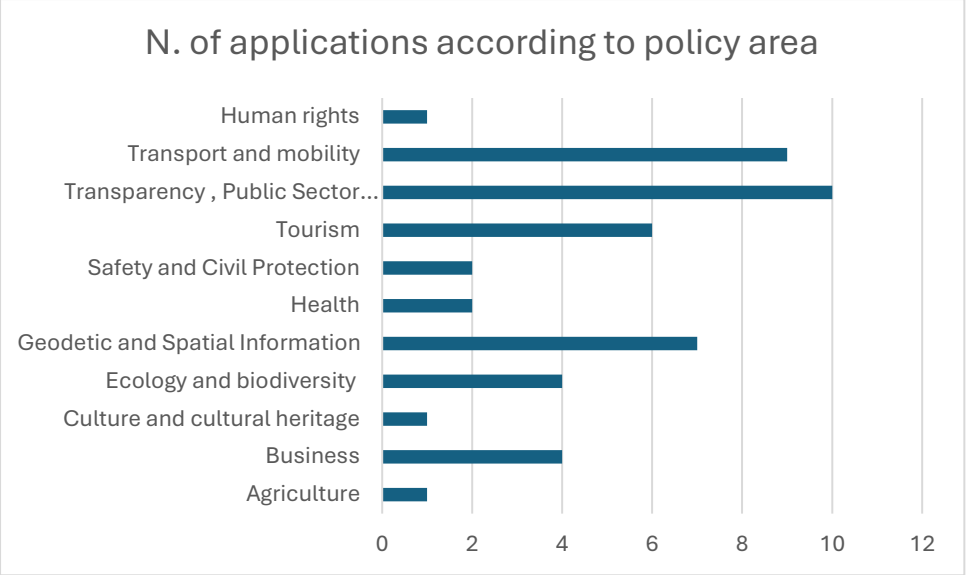


While these findings suggest that the Slovenian O(G)D ecosystem has generated a certain number of reuse initiatives over time, the uneven temporal distribution of these initiatives and the share of non-functional cases might point to a pattern of project-based rather than institutionally sustained innovation.

3.2 Policy area of the applications

In terms of policy areas addressed by these applications, the greatest concentration of interest is observed in the domains of "Transparency, Public Sector governance and Democracy" and "Transport and mobility". These are followed by applications focusing on the "Tourism" sector and "Geodetic and Spatial Information". Figure 2 presents the distribution of the identified applications across the various policy areas.

Figure 2: Number of applications according to policy area



This distribution of applications across policy areas suggests that the reuse of O(G)D in Slovenia is not evenly developed, but rather concentrated in sectors where institutional, technical, and strategic conditions are more favourable. The strongest concentration can be observed in the domains of "Transparency, Public Sector Governance and Democracy", followed by "Transport and Mobility", while Tourism and Geodetic and Spatial Information also emerge as important areas of application.

The prominence of applications in the field of transparency, governance and democracy suggests that the reuse of O(G)D in Slovenia remains closely tied to the institutional logic of public sector data production and ownership. These are domains in which public institutions are the main producers and custodians of the underlying datasets and where information disclosure is directly linked to broader principles of accountability, oversight, and democratic openness. Many applications in this category are built on government-generated data and, in line with the overall findings, often involve public organisations beyond the role of passive data providers. This suggests that O(G)D reuse may be more developed in areas where state transparency obligations coincide with the availability of structured administrative data and the political visibility of open data policies.

This pattern also reflects broader international developments. Over the past decade, governments have been increasingly exposed to external scrutiny regarding the implementation and performance of open government data policies, particularly through international benchmarking exercises and comparative assessments (e.g. OURdata Index and Open Data Maturity). In this context, domains related to transparency and democratic oversight become especially salient, both symbolically and practically. The prominence of applications in this field may therefore be interpreted not only as a result of data availability, but also as a response to the normative and reputational pressures associated with contemporary open government reforms.

A similarly strong concentration in the transport and mobility sector can be explained through a somewhat different but complementary logic. In this area, the development of O(G)D-based applications appears to be supported by a comparatively mature ecosystem of standardisation, interoperability, and EU-level policy coordination (Data.europa.eu, 2025). Transport-related data are particularly suitable for reuse because they are often continuously generated, relatively standardised, and well suited for real-time and user-oriented services. This creates favourable conditions for the development of digital applications with immediate practical value, such as

route planning, traffic monitoring, or mobility optimisation. The Slovenian cases therefore appear to reflect wider European developments, in which mobility data have become one of the more operationalised and innovation-friendly domains of public sector data reuse.

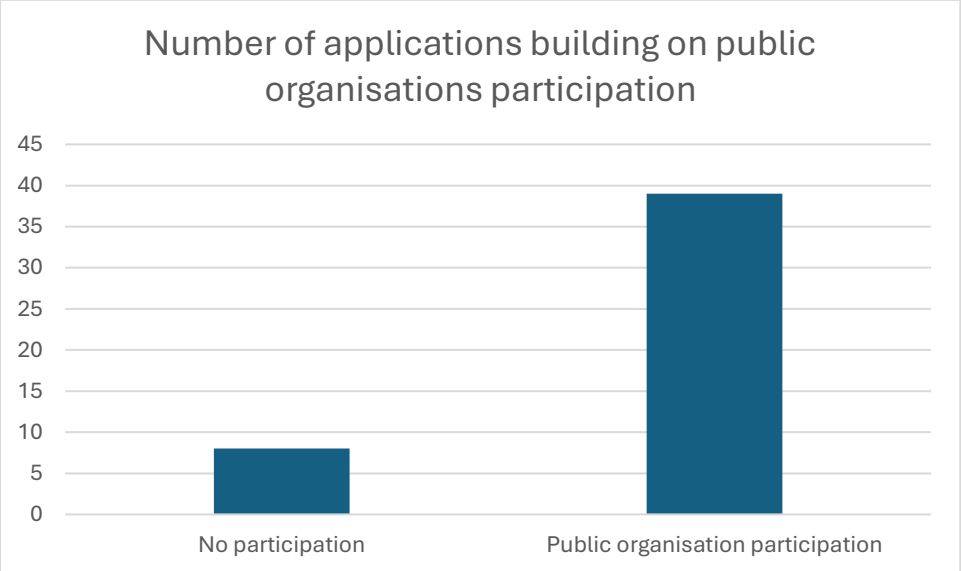
A comparable dynamic can also be observed in the field of geodetic and spatial information. Spatial datasets have long been among the most systematically collected, standardised, and technically interoperable forms of public sector information. Their prominence in the Slovenian case suggests that O(G)D reuse is more likely to emerge in sectors where data infrastructures are already relatively mature and reusable across different contexts. Geospatial data are also particularly valuable because they can easily be combined with other administrative, environmental, or mobility-related datasets, thereby functioning as an enabling layer for a wide range of digital services.

Finally, the visible presence of the tourism sector points to its strategic importance within the Slovenian development context and suggests that this field is particularly open to experimentation and innovation.

3.3 Public organisations involvement

Regarding the involvement of public organisations in the development of the identified applications, the findings suggest that the Slovenian O(G)D reuse ecosystem is characterised by a strong presence of public sector actors. In the majority of cases (39 out of 47), public organisations participated actively in the development, implementation, or operation of the application, thereby going beyond the role of mere passive data providers (Figure 3). By contrast, only a smaller number of applications (8) were developed without such active public sector participation, primarily by private sector actors, non-governmental organisations, or civic-tech communities.

Figure 3 Applications building on public organisations participation



This finding indicates that the reuse of O(G)D in Slovenia is, to a considerable extent, not driven solely by external actors making use of publicly released datasets, but often unfolds through more direct forms of institutional involvement. In this sense, public organisations frequently appear not only as data providers, but also as enabling partners, co-developers, or institutional supporters of data-driven applications. This suggests that the Slovenian O(G)D landscape is

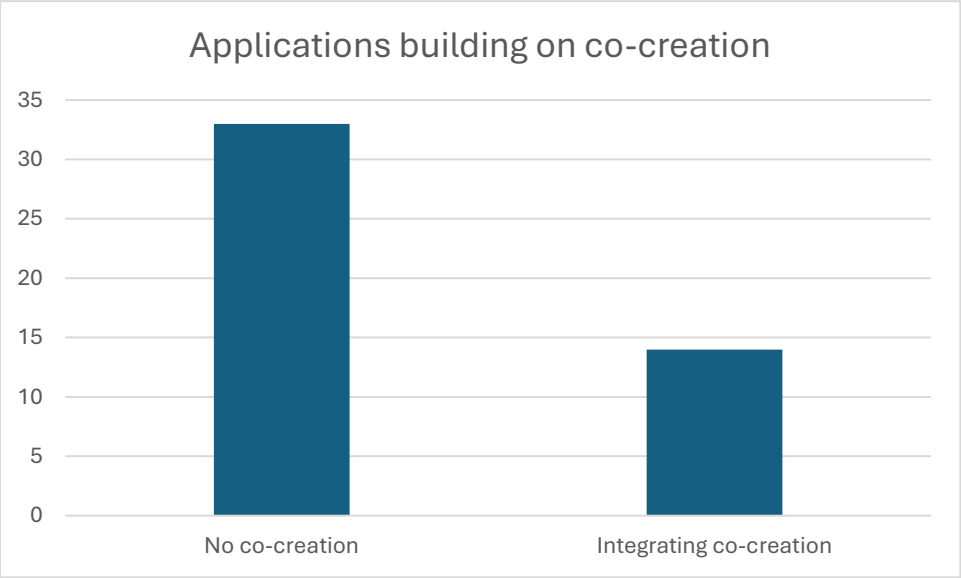
shaped less by a purely market-driven or bottom-up innovation model and more by a pattern of publicly embedded or institutionally supported reuse.

At the same time, the existence of a smaller but visible group of applications developed independently of public organisations remains analytically important. These cases demonstrate that O(G)D and publicly accessible information can also be mobilised by actors outside the state, including civil society initiatives, private developers, and citizen-led innovation communities. Their presence indicates that public value creation through data reuse does not depend exclusively on formal institutional participation, even if such participation remains highly significant in the Slovenian context.

3.4 Applications resulting from OGD driven co-creation

As OGD-driven co-creation is the main focus of our paper, we sought to identify applications in which co-creation was either central to their development or embedded in their operation, particularly through the co-creative delivery of services. Figure 4 shows, however, that co-creation is still not a standard approach in the development and operation of such applications.

Figure 4 Applications integrating co-creation principles



We identified 14 applications linked to co-creation, either because they were developed through co-creative processes or because co-creation is built into the way they function, for example through user-generated informational inputs. In all but one case, public sector organisations were involved in the initiative (see Table 1). Most of these applications also rely on open government data (OGD). However, three exceptions (Srna, Bobrosled and Invazivke, see Table 1) stand out: these are citizen-science cases in which the applications do not build on previously available OGD, but instead generate new open data through direct citizen contributions. This is an important observation indicating that for O(G)D-driven co-creation ready-made government datasets are not a precondition.

One further exception is eVineyard. This application was developed through collaboration between viticulturists, agronomists, IT specialists, and engineers. Public organisations did not play an active role in the co-creation process beyond providing OGD. The initiative was therefore driven mainly by actors from the private sector and research organisations.

Table 1: Applications that rely or integrate the principles of co-creation

N.	Application	State institution(s) participation	Co-creation principles embedded	OGD use
1.	Tracker (Sledilnik) COVID-19	Yes	Yes	Yes
2.	Doctors Tracker (Zdravniki Sledilnik)	Yes	Yes	Yes
3.	Earthquake Impact Assessment (POTROG)(Ocena posledic potresa)	Yes	Yes	Yes
4.	PROMET+	Yes	Yes	Yes
5.	Srna	Yes	Yes	**No (No OGD but OD)**
6.	Bobrosled	Yes	Yes	**No (No OGD but OD)**
7.	Invazivke	Yes	Yes	**No (No OGD but OD)**
8.	maPZS	Yes	Yes	Yes
9.	Nexto application	Yes	Yes	Yes
10.	Gremo na pot	Yes	Yes	Yes
11.	eVineyard	**No**	Yes	Yes
12.	Tourism impact model	Yes	Yes	Yes
13.	Tourism Flows (FLOWS)	Yes	Yes	Yes
14.	T4.0 Core, a tool for collaboration	Yes	Yes	Yes

3.4.1 Applications that fulfil the criteria of OGD-driven co-creation: a cross-case perspective

The ten applications identified above (Table 1, for more see Annex) are particularly relevant for further analysis because they fulfil all three core criteria of OGD-driven co-creation used in this study: involvement of public sector organisation(s), the presence of co-creation, and the use of open government data (OGD). Rather than treating them merely as illustrative examples, they are analysed here as empirical manifestations of how OGD-driven co-creation is enacted in practice in Slovenia.

A first notable pattern is that these applications are concentrated in policy areas where timely, context-specific, and actionable information is essential for public value creation. This is particularly evident in the fields of public health (Tracker COVID-19; Tracker of Doctors), disaster preparedness (POTROG), transport and mobility (PROMET+), outdoor safety and accessibility (maPZS; Gremo na pot), and tourism and destination management (Nexto; Tourism Impact Model; Flows; T4.0 Core). Especially the first three applications have aimed to address a burning problem that affects significant number of people. Across these cases, the publication of data alone would not be sufficient. Their value depends on the translation of data into usable tools, interfaces, and services that respond to concrete user needs.

A second important pattern concerns the role of public organisations. The cases show that public sector actors do not participate in a single, uniform way. In some cases, they act mainly as providers of official data and support its outreach (including informal support in overcoming data-related barriers), as seen in the Tracker of Doctors. In others, they play a more active enabling role

by supporting infrastructure, legitimacy, funding, or institutional uptake, as in maPZS and Gremo na pot. The cases also differ in how coordination is organised. In POTROG and PROMET+, public organisations act as direct co-developers or institutional leads, taking an active role in shaping both the design and use of the applications. In the Tourism 4.0 applications, by contrast, coordination was led by a private project leader, while public organisations participated primarily as partners, data providers, and users of the tools. This variation suggests that OGD-driven co-creation is not tied to a single governance model, but can emerge under different coordination arrangements, placing different demands on public sector involvement.

The cases also show that co-creation is embedded at different stages of the service lifecycle. In some instances, external actors contribute to the design, content, or functionality of the application, as seen in Nexto and in the Tourism 4.0 applications. In other instances, co-creation is embedded in the operation of the service itself, through the continuous provision of data, observations, corrections, or feedback by users. This is particularly evident in Tracker COVID-19, Tracker of Doctors, POTROG, PROMET+, and maPZS. Several cases, however, combine both dimensions. PROMET+ and the Tourism 4.0 applications are especially illustrative in this respect, as they involve both stakeholder participation in shaping the tools and ongoing user-generated data inputs. In these cases, co-creation is not limited to consultation, but forms part of the ongoing production and refinement of the service.

A further insight concerns the role of data. Although all selected applications use OGD, the cases show that OGD rarely functions as a standalone input. Instead, it is typically combined with other forms of data, such as citizen-generated inputs, institutional datasets, sensor-based data, or locally produced knowledge. This is especially evident in cases such as POTROG, PROMET+, maPZS, and the Tourism 4.0 applications. The findings therefore suggest that the practical implementation of OGD-driven co-creation depends on the capacity to integrate heterogeneous data sources into a coherent and usable service.

Across the cases, effective initiatives rely on collaboration across institutional boundaries, the ability to combine different types of data, and the capacity to sustain iterative forms of user involvement over time.

Discussion and Conclusion

The paper examined the extent to which Slovenia's comparatively advanced open government data (OGD) framework has translated into a broader ecosystem of data-driven applications and, more specifically, into instances of OGD-driven co-creation. The findings point to a clear overarching conclusion: although Slovenia has developed a relatively mature OGD framework, the reuse of data is only selectively translated into co-creative practices. Where such practices do emerge, they are shaped primarily by strong institutional embedding, sectoral data maturity, and the capacity to combine heterogeneous data sources.

The mapping identified 47 applications developed between 2005 and 2024, predominantly in the form of digital platforms, portals, and mobile applications. This points to a visible and relatively diverse landscape of O(G)D reuse in Slovenia. At the same time, 10 of the identified applications were no longer functional at the time of analysis. The reasons for this are not directly observable from the available data. Non-functionality may reflect different underlying dynamics, including the project-based nature of some initiatives, the obsolescence of technological solutions, or the fact that certain applications were designed to address time-bound policy problems. As such, this finding should be interpreted with caution. Rather than indicating a single structural

weakness, it suggests that O(G)D-based applications in Slovenia are characterised by varying lifecycles and degrees of continuity.

A closer look at the policy distribution of the identified applications further qualifies this picture. The findings show a clear concentration in a limited number of domains, particularly transparency and public sector governance, transport and mobility, tourism, and geodetic and spatial information. These patterns suggest that O(G)D reuse in Slovenia is not evenly distributed, but tends to develop in sectors where enabling conditions are more favourable. In some cases, this is due to the existence of mature and standardised data infrastructures, as seen in transport and geospatial domains. In others, it reflects strong institutional and normative pressures, particularly in areas related to transparency and democratic accountability. Importantly, the most advanced and socially relevant applications are typically found in sectors characterised by a high degree of problem urgency—such as public health, disaster preparedness, or mobility—where the practical value of data-driven solutions becomes immediately evident.

A further defining feature of the Slovenian case is the strong involvement of public sector organisations. In most identified applications, public institutions participated actively in their development, implementation, or operation, going beyond the role of passive data providers. This suggests that O(G)D reuse in Slovenia is largely institutionally embedded, with public actors serving not only as sources of data, but also as enablers, partners, and, in some cases, co-developers of data-driven solutions. At the same time, some of the most prominent and socially significant applications—most notably COVID-19 Sledilnik and Zdravniki Sledilnik—demonstrate that bottom-up initiatives can also play a crucial role, particularly in contexts of acute problem pressure where existing institutional responses are perceived as insufficient. The overall pattern therefore points to an ecosystem shaped primarily by publicly supported and collaborative forms of innovation, while also leaving space for civic-led initiatives that can become highly influential under conditions of urgency.

Within this broader landscape, co-creation emerges as a visible but still non-dominant mode of O(G)D reuse. Only a limited subset of the identified applications incorporates co-creation principles, either in their development or in the way the service operates. Where present, co-creation takes different forms, ranging from multi-stakeholder collaboration in the design phase to continuous user involvement through feedback, data contributions, or content generation. In several cases, these dimensions are combined, producing more iterative and participatory forms of service development. At the same time, the overall pattern suggests that co-creation in Slovenia remains selective and context-dependent rather than representing a systemic or mainstream model of O(G)D reuse. It is most clearly present in applications that address concrete societal problems, where collaboration between public institutions, experts, and citizens becomes a practical condition for producing relevant and usable solutions.

An important additional insight concerns the nature of the data sources underpinning these applications. The findings show that the Slovenian ecosystem of data-driven innovation cannot be understood solely through the narrow formal category of open government data. Given that the analysis covers the period from 2005 to 2024—a period during which the standards, definitions, and policy expectations surrounding OGD evolved considerably—many applications rely on forms of publicly accessible information that would not necessarily qualify as fully open data under contemporary criteria. This temporal dimension is important because it highlights that, in practice, the reuse ecosystem is broader than the formal OGD framework alone. Many applications build not exclusively on strictly open and machine-readable government datasets, but on a wider range of publicly accessible information resources.

Taken together, these findings point to four key characteristics of the Slovenian O(G)D reuse ecosystem. First, data reuse is strongly institutionally embedded, with public organisations playing an active and often central role. Second, co-creation is present, but remains limited and selective rather than systemic. Third, OGD alone is rarely sufficient, as most applications depend on combining multiple types of data. Finally, the most developed and impactful cases tend to emerge in sectors where data infrastructures are relatively mature or where there is a clear and pressing societal need for data-driven solutions.

At the same time, the study is subject to several limitations. As it relies on qualitative desktop analysis, it should be understood primarily as a mapping exercise rather than as a comprehensive evaluation of O(G)D reuse in Slovenia. The analysis does not assess the actual impact or effectiveness of individual applications, may not capture all existing cases, and depends on publicly available information, the completeness and reliability of which may vary. Future research should therefore build on these findings through in-depth case studies and organisational analysis in order to better understand the conditions under which OGD-driven co-creation can be sustained, institutionalised, and scaled.

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Annex – Brief description of OGD driven co-creation cases

Tracker Covid-19 (Sledilnik Covid-19)

The Tracker Covid-19 (Sledilnik COVID-19) (Covid-19 Sledilnik, 2020; Mreža občanske znanosti, 2026; Pirc, 2025) initiative emerged in early March 2020 in response to the lack of structured and

timely data on the spread of SARS-CoV-2 in Slovenia. The initiative was founded by Luka Renko, a technology expert, whose personal concern for respiratory illnesses catalysed the collection of epidemiological data. Initially a private endeavour, the project rapidly evolved into a large-scale, decentralised, volunteer-driven network comprising professionals and laypersons alike—from statisticians and physicians to designers and communication experts.

The primary goal of Sledilnik was to gather, verify, analyse, and publicly disseminate reliable, anonymised data on COVID-19 cases, hospitalisations, and testing. This was achieved through cooperation with official institutions such as the National Institute of Public Health (NIJZ), the Ministry of Health, hospitals, and local civil protection units. From late March 2020 onwards, Sledilnik established direct channels with these organisations for receiving structured data.

Public sector collaboration was pragmatic and often informal, leveraging personal contacts within hospitals and ministries. Notably, some public servants and professionals supported the initiative from within institutional boundaries, facilitating access to critical datasets. Despite initial institutional reluctance, the initiative contributed to digitalisation efforts, data quality improvements, and even influenced official modelling strategies.

Sledilnik is a paradigmatic example of co-creation in public administration. Citizens were not merely data consumers but active co-producers. Contributions included data entry, model development, translation, communication, and visualisation. Importantly, the openness of the platform encouraged widespread public engagement and ensured that the data and visualisations were reusable under a Creative Commons licence.

The initiative demonstrated how inclusive, citizen-led innovation—anchored in scientific reasoning, transparency, and open collaboration—can address systemic gaps in times of crisis. As a recognised civil society effort, Sledilnik not only filled critical information voids but also set a benchmark for participatory public data infrastructures in Slovenia and beyond.

Tracker of doctors (Sledilnik zdravniki)

The Sledilnik Zdravniki initiative represents an extension of the civic tech efforts initiated by the Znanstveno društvo Sledilnik (Scientific Association Sledilnik)(Luzar, 2021; Skok, 2021; S.R., 2025; STA, 2021; Svet24.si/L.J, 2021; ZD Sledilnik, n.d.), best known for its COVID-19 data visualisation platform. Launched in response to persistent systemic issues in accessing primary healthcare in Slovenia—most notably the widespread lack of available family doctors, gynaecologists, paediatricians, and dentists—the initiative addresses the growing population of uninsured individuals without a designated primary physician, which has surpassed 130,000 people in recent years.

The core objective of the Sledilnik Zdravniki platform is to enhance transparency and usability of official healthcare data through a publicly accessible, user-friendly online search tool. Drawing from open data published by the Health Insurance Institute of Slovenia (ZZZS), the initiative transforms these raw datasets—often difficult to interpret or outdated—into interactive maps and directories that indicate the availability of personal doctors at the municipal level.

Developed and maintained by a volunteer team of over 25 individuals with expertise ranging from software engineering and design to health communication and analytics, the project embodies the principles of co-creation and open science. Importantly, citizens are not merely end users but

actively contribute through feedback mechanisms, reporting data discrepancies, and in some cases, direct collaboration on data validation and interface design.

Public institutions including ZZZS, the Ministry of Health, and the Medical Chamber of Slovenia have collaborated with the project, albeit informally, by facilitating access to datasets and supporting its outreach. While the platform does not solve structural shortages in human resources within the healthcare system, it provides critical support in mitigating informational barriers, helping individuals identify potential providers and highlighting regional inequalities in service availability.

The initiative's data visualisations also serve analytical purposes. Beyond individual searches, the project publishes accessible reports and dashboards on trends such as the distribution of uninsured populations, regional disparities in service provision, and structural stress on the primary care system. These outputs are intended to inform not only the public, but also policymakers, researchers, and civil society actors advocating for more equitable healthcare access.

Earthquake impact assessment application (POTROG)

The Earthquake Impact Assessment is application developed within the POTROG project – a long-term governmental initiative developed to support civil protection and disaster preparedness in Slovenia(GOV.SI, 2022; Inštitut za vodarstvo & Zavod za gradbeništvo Slovenije, 2023; POTROG, 2026). Initiated in 2011 under the Ministry of Defence and led by the Administration of the Republic of Slovenia for Civil Protection and Disaster Relief (URSZR), POTROG is the outcome of successive developmental research cycles (POTROG 1–4) that stem from early municipal risk preparedness strategies in Ljubljana dating back to 1997.

The goal of POTROG is to provide expert foundations and digital tools to enhance earthquake preparedness, immediate response, and post-event recovery. Developed by a consortium including the Slovenian National Building and Civil Engineering Institute (ZAG), the Institute for Water of the Republic of Slovenia, and the Slovenian Environment Agency, POTROG delivers several interactive web-based applications.

Central to the initiative is the Earthquake Impact Assessment Tool, a professional decision-support system designed for civil protection planners and emergency response teams. The application integrates data from multiple public registries (CRP, AJPES, GURS, etc.) and enables rapid scenario-based assessments of building damage, population exposure, and infrastructure vulnerability based on earthquake intensity and epicentre. It supports emergency simulations and planning at national, regional, and municipal levels.

Key functionalities include estimating the number of uninhabitable or partially damaged buildings, modelling day/night population exposure, calculating rubble volume, and forecasting necessary emergency personnel and logistics for the first 120 hours of crisis management. The platform also allows users to simulate scenarios using EMS-98 intensity scales and supports training, exercises, and visual communication of risk.

POTROG's co-creative dimension is embodied in its integration of public participation mechanisms, notably through the companion tool Did You Feel It? (Ali si čutil?), which gathers citizen-reported effects after an earthquake and feeds this information back into the assessment engine. This citizen science approach enhances situational awareness and

provides real-time data on perceived shaking and emotional responses, such as fear or evacuation behaviour.

The POTROG suite includes public-facing tools (Assess Your Building) and professional modules (Building Occupancy Modelling, Infrastructure Accessibility Analysis), reflecting a comprehensive and modular design for multi-level engagement. Although the core application is intended for institutional use, its transparent and accessible design also serves educational purposes, thus fostering broader societal preparedness.

TRAFFIC+ (PROMET+)

Promet+(Boncelj, 2019; Dars, 2006; Pavšič, 2022) is a mobile application developed by the Slovenian motorway company DARS to enhance road safety and mobility efficiency through real-time traffic monitoring and user engagement. Designed as a smart mobility solution within the framework of the European C-Roads initiative, Promet+ serves both as a public information platform and a testing ground for Cooperative Intelligent Transport Systems (C-ITS), enabling two-way communication between vehicles and road infrastructure (Vehicle-to-Everything, V2X).

The primary aim of Promet+ is to deliver accurate, context-sensitive traffic data directly to drivers. It does so by combining official sources (e.g., traffic loops, surveillance systems, and DARS traffic management centres) with crowdsourced data collected via the app itself. Users receive timely, localised alerts about road closures, congestion, accidents, and dangerous situations such as wrong-way driving—information which is often communicated just seconds after detection. Notably, DARS reports that such incidents were identified and communicated to nearby drivers in real-time over two dozen times in just a two-month period.

The app also introduces a participatory dimension, inviting users to report events directly—provided it is done safely (e.g. by passengers or after stopping). Integration with the Moj Promet web portal allows for cross-platform configuration and personalisation of alerts and favourite locations.

MaPZS

The maPZS (*maPZS*, 2026; M.P., 2025; Planinska zveza Slovenije, 2025; STA, 2025) application represents a major national initiative to improve accessibility, safety, and sustainability in mountain trail use across Slovenia. Its primary goal is to provide hikers with accurate, up-to-date, and accessible information on more than 10,000 km of marked mountain trails, while simultaneously supporting trail managers in their maintenance responsibilities. The initiative was established by the Alpine Association of Slovenia (Planinska zveza Slovenije, PZS) and is based on the central Trail Register (Register planinskih poti), which has been maintained since 2003.

Developed with the support of the Ministry of Public Administration and the Government Information Security Office (URSIV), maPZS exemplifies successful public–civil cooperation. Public institutions provided funding and digital infrastructure, while the PZS contributed technical expertise and direct connection to local mountaineering clubs responsible for trail upkeep. The initiative further draws on open geospatial data and coordinates with the Surveying and Mapping Authority of the Republic of Slovenia (GURS) and public transport providers to enable integration of trail access points with sustainable mobility options .

The principle of co-creation is deeply embedded in the maPZS platform. The trail data it provides is not static but continually updated based on contributions from over 220 local mountaineering clubs and increasingly also from individual users. Through the web interface, users can report trail damage, suggest corrections, and provide local knowledge. This participatory mechanism ensures not only data quality but also a shared sense of responsibility for trail stewardship.

In addition to individual trip planning, the application enables personalised route creation, offline use, and integration with weather and safety alerts, making it a robust tool for both public users and professional planners. It is available through mobile platforms and synchronised with the central information system of PZS, providing a unified interface for citizens, volunteers, and institutions alike.

Nexto application

Nexto (Narodni Muzej Slovenije, 2026; Nexto, 2026; Proxima NCOM, 2020; Tomšič, 2015, 2016) is a Slovenian-developed smart tourism platform that aims to transform how individuals engage with cultural heritage, museums, and urban spaces. Its goal is to provide an interactive, personalised, and accessible visitor experience using augmented reality (AR), gamification, and audio-visual storytelling. At its core, Nexto functions as a mobile companion—capable of replacing traditional tour guides—by enabling self-directed, narrative-rich exploration of heritage sites and exhibitions.

The initiative was founded by the Ljubljana-based innovation company IZIT and has evolved in close collaboration with public cultural institutions, including the National Museum of Slovenia, the Slovenian Tourist Board, and municipal heritage authorities. These partnerships were instrumental in content creation and platform adoption, providing curated historical data, 3D reconstructions, and multilingual support for international visitors.

Nexto embodies principles of co-creation in several dimensions. Firstly, institutional partners contribute verified narratives and assets, ensuring historical and contextual accuracy. Secondly, the platform encourages user-generated feedback and suggestions, which inform ongoing content refinement and technological development. In many cases, local museums and tourist organisations have actively participated in designing interactive quests, challenges, and AR scenarios tailored to specific sites.

The app supports geolocation-triggered content and offline functionality, making it ideal for both urban and rural settings. By blending storytelling with real-time contextual data, Nexto allows visitors to "travel through time" and interact with heritage in a dynamic, playful manner. Its co-produced experiences aim to democratise access to cultural education, increase visitor engagement, and support the digital transformation of the tourism and culture sectors.

Public recognition has followed: Nexto has been piloted in several Slovenian cities and expanded to international markets, including the UK, Portugal, and Israel. Through innovative public-private partnerships and a participatory design ethos, Nexto serves as a leading example of how digital technologies can be embedded in public cultural infrastructure in a sustainable, user-centred way.

Let's hit the road (Gremo na pot)

Gremo na pot (Mršol, 2026; RRA LUR, 2026) is a Slovenian digital platform designed to support sustainable tourism and promote lesser-known hiking and cycling routes across Central Slovenia. The initiative's primary objective is to facilitate local exploration, reduce the environmental pressure on overvisited natural areas, and encourage active mobility through accessible and well-documented outdoor itineraries. The project was coordinated by the Regional Development Agency of the Ljubljana Urban Region (RRA LUR), in cooperation with the City of Ljubljana and numerous municipalities, regional institutions, and tourism stakeholders.

The platform was developed within the European cohesion framework and financed through the Operational Programme for the Implementation of the EU Cohesion Policy. It aggregates verified data on over 100 thematic trails, cycling routes, nature trails, and cultural excursions across 26 municipalities. Each route includes detailed descriptions, maps, photographs, GPS navigation, public transport connections, and sustainability tips.

The principles of co-creation are deeply embedded in the development and operation of the platform. The content is co-produced by local communities, regional tourism providers, nature park managers, and municipal offices. These actors contribute local knowledge, historical insights, and maintenance updates. Additionally, citizen feedback and route recommendations are continuously integrated through online forms and user interaction, ensuring the system remains relevant and inclusive.

Tourism impact model

The Tourism Impact Model (TIM) (T4.0, 2026; Tourism 4.0, 2020, 2021) is an analytical tool developed under the broader framework of Tourism 4.0, Slovenia's flagship initiative for transforming the tourism sector into a technologically advanced, sustainable, and innovation-driven domain. The initiative emerged from the largest government-funded R&D project in Slovenian tourism, launched in 2018, and was led by the high-tech company Arctur d.o.o. in collaboration with various academic, public, and private stakeholders.

TIM serves as a decision-support system that enables local communities, tourism organisations, and policymakers to understand, measure, and manage the multifaceted impacts of tourism—economic, environmental, social, and cultural—on specific destinations. The model integrates large OGD datasets, often referred to as big data, to assess tourism flows, resource usage, and visitor behaviours in real time. This functionality empowers decision-makers to plan for more sustainable tourism development that balances growth with the well-being of local residents and the preservation of natural and cultural resources.

Public organisations play a central role in the TIM ecosystem. Through structured partnerships with municipalities, regional development agencies, and national tourism bodies (such as the Slovenian Tourist Board), public sector actors co-create data parameters, policy frameworks, and application scenarios that reflect local priorities. This ensures that the model is not merely a technical instrument but a strategic governance tool tailored to community needs.

The development and implementation of TIM exemplify the principles of co-creation embedded in the Tourism 4.0 approach. Stakeholders—including local authorities, citizens, tourism providers, and researchers—are actively involved in shaping the model's design, data inputs, and interpretative frameworks.

Tourism Flows (FLOWS)

The Flows(Arctur, 2026b, 2026c; Urbančič et al., 2020) application is a digital tool developed within the framework of the Tourism 4.0 initiative in Slovenia, aiming to support data-informed decision-making in tourism management through the analysis of spatial and temporal mobility patterns. The application has been developed by the Slovenian company Arctur d.o.o. as part of broader efforts to integrate technological innovation into public sector tourism governance.

A distinguishing feature of Flows is its utilisation of Open Government Data (OGD), including anonymised datasets from public infrastructure (e.g. transport systems, road sensors, public events), and—where available—aggregated telecommunications data. By systematically analysing the movement of people across territories, the application provides insights into population flows, with specific attention to differentiating between residents, tourists, daily commuters, and transit populations. These insights are relevant for local administrations and tourism organisations in terms of urban planning, event management, and infrastructure load forecasting.

Public sector involvement in Flows occurs both as data providers (through OGD) and as users of the application's outputs. Municipalities, regional authorities, and national tourism organisations use the tool to obtain empirically grounded evidence that can inform policy decisions related to tourist dispersal, environmental impact mitigation, and service provision. Importantly, the application does not merely serve as a monitoring mechanism; it also enables stakeholders to explore scenario-based simulations, such as predicting the effects of changes in accessibility or public transport schedules on visitor distribution.

The development of Flows follows the principles of co-creation, understood here as the active involvement of diverse stakeholders—public authorities, technology developers, tourism professionals, and in some cases, local residents—in defining the system's functionalities and data frameworks. This collaborative approach contributes to a higher degree of relevance and contextual specificity, particularly in adapting the application to different territorial and governance settings.

In summary, Flows represents a data-driven approach to tourism management that links publicly accessible data sources with real-time spatial analytics, grounded in a governance model that encourages stakeholder participation. While not without challenges—particularly concerning data availability, privacy, and interoperability—such tools reflect ongoing shifts toward evidence-based, digitally enabled public administration in the field of tourism.

Collaboration platform T4.0 Core

The T4.0 Core (Arctur, 2022, 2026a; Lešnik Štuhec et al., 2023) is a central digital infrastructure developed within the framework of the Tourism 4.0 initiative in Slovenia. Its primary purpose is to enable systematic, transparent, and secure data sharing and analytics among stakeholders in the tourism ecosystem. As a collaborative platform, it facilitates interoperability between multiple technological applications—notably the Tourism Impact Model (TIM), Flows, DOTI (Digital Tourist Identity), and CIT (Collaboration Impact Token)—which form the core pillars of the Tourism 4.0 ecosystem.

The T4.0 Core emerged from the largest public R&D investment in Slovenian tourism to date and is rooted in principles of open data use, distributed governance, and decentralised innovation. Developed by the high-tech company Arctur d.o.o., the platform functions as both a data

repository and a processing environment that employs enabling technologies from Industry 4.0 (e.g. AI, blockchain, and big data analytics). These technologies support data integration and enrichment, allowing stakeholders to produce actionable insights for decision-making and strategic planning.

A distinctive feature of T4.0 Core is its emphasis on local data sovereignty. Unlike systems reliant on third-party global platforms (e.g. Google or Booking.com), T4.0 Core aggregates data from local and public sources, ensuring that both the data and derived knowledge remain accessible to domestic stakeholders. This approach enhances policy autonomy and aligns with broader EU objectives related to data governance and digital transformation.

Public organisations are integrally involved, both as contributors of open government data and as users of the system's analytical capabilities. Through collaboration with municipalities, regional development agencies, and tourism boards, the platform is tailored to reflect local priorities. The platform's use of anonymised, high-quality data strengthens evidence-based policy development, for example in areas such as sustainable visitor management, mobility planning, and infrastructure investment.

The development of T4.0 Core is inherently co-creative. It has been shaped through participatory design processes involving public, private, academic, and civil society actors. These engagements not only inform the platform's architecture but also serve as a mechanism for capacity-building and digital literacy among stakeholders.