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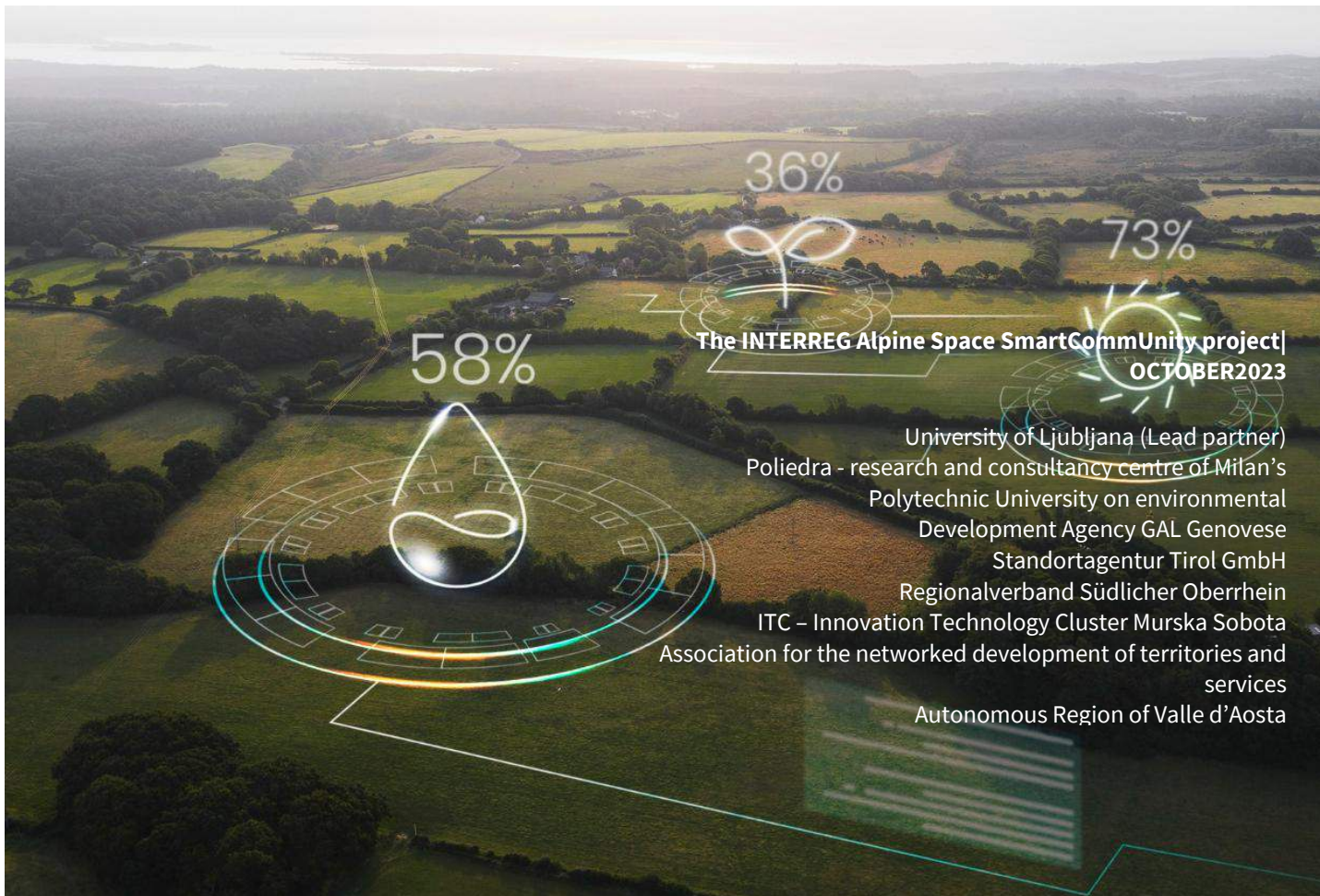


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Alpine Space

SmartCommUnity

REPORT & GUIDELINES | Community Based Data Approach



Community Based Data Approach

Report and Guidelines

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Abstract

Community Based Data Approach for inclusiveness and access

Developing an innovative community-based data approach to rural digital ecosystems, moving beyond the concept of local heroes to enhance inclusiveness and access.

To achieve this, the report is a fundamental source of data-related concepts to support the efforts of the Work Package Test Areas Network (WPTAN) in promoting a community-based approach in Test Areas (TAs) across all work Packages (WPs) to establish a transnational rural digital ecosystem. This approach will not only enhance inclusivity and accessibility across the SmartCommUnity project but also serve as a source of inspiration for Follower Test Areas (FTA) to follow the lead of Lighthouse Test Areas (LTA).

Additionally, the report is supporting new approaches for data visualization techniques within Work Package Information Technology (WPIT). This will further aid in our efforts to make data more understandable and accessible for users of online Innovation Platform.



1. Introduction

The data economy is a global digital ecosystem in which data producers and consumers - businesses, individuals, and public administrations - collect, organize, and share aggregated data from a wide range of sources. The smart use of data can have a transformative impact across industries and create new opportunities for economic growth, not only for large companies, small and medium-sized enterprises, but also for other sectors of society, including (digital) public services providers, national or regional authorities, municipalities, and communities.

The SmartCommUnity project consortium recognizes the importance of effective data management and to this end, invited partners of the project companies to rethink the data economy and value creation in a workshop on this theme on the 2nd project meeting in Willisau, Switzerland, on 14th of September 2023, where partners had an opportunity to further comment and contribute to existing good practices and possible solutions to overcome sector specific barriers described in this document.

2. Report's main objectives

The aim of this report is to propose an innovative, community-based data approach for rural and remote areas in Europe. To identify this approach, we are first looking into the state of the art of (rural) open data and the possibilities it can offer for rural communities, as well as some recommendations that the European Commission suggests for bridging the digital divide between rural and urban areas. Additionally, we have presented the main barriers to adopting data approaches in rural settings and proposed various solutions for overcoming these barriers. Possible solutions stem from the idea of community ownership of data and are presented in more detail throughout chapter 1.3. Focus is given to EU data spaces and data ecosystems, as well as rural digital innovation hubs, that are already making a huge difference in terms of smart transition in rural areas and living labs - proven testing grounds for provision of digital technologies and uptake of innovative solutions for rural communities. Another important concept presented is data stewardship, believed to be an exemplary approach for a community setting. The concept of rural data stewards will be more thoroughly presented in a diagram representing the community-based data approach we are proposing in this deliverable.



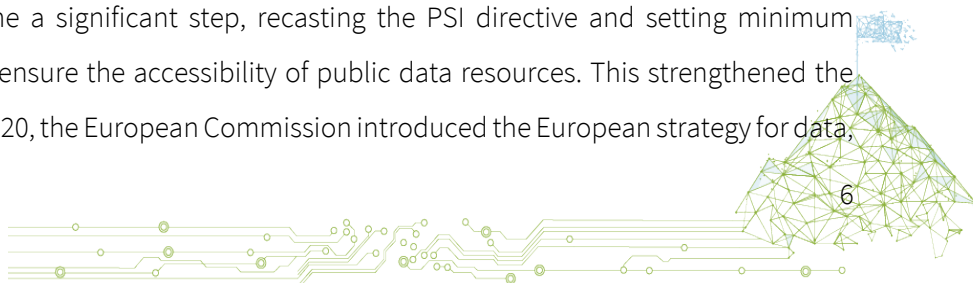
Additionally, we will offer some good practice examples that aim to illustrate the value of open data and the opportunities it can present. Examples are coming from different European countries and are related to the fields of education, business, finance, public services, cultural heritage, energy, and agriculture.

This deliverable is concluded with a representation of SmartCommUnity test areas' service proposals, collected through a survey and finally, with a definition of a community-based data approach, developed within the SmartCommUnity project Test areas and networking work package. Furthermore, through collection of implementation ideas throughout TAs these efforts support Work Package Test area networks on establishing data-based community approach to create a transnational database on rural digital ecosystems for enhancing inclusion and access, inspiring the smart transition, empowered by established lighthouse test areas, of follower test areas while exploring possible data visualization approaches, benefiting Work Package IT's Innovation Platform. Evolving from the definition of Smart Communities, in the conclusion, the proposal for Data based community approach is described.

3. Exploring the concepts for “Community Based Data Approach”

To start exploring the concept of “Community based data approach” we want to introduce an array of solutions within the SmartCommUnity project, making a quick overview of the historical process of EU-based data initiatives. Since 2003, the European Commission has made significant progress in open data initiatives. In 2003, Directive 2003/98/EC laid the foundation for open data access by focusing on the re-use of public sector information (PSI) in the EU. A notable milestone occurred in 2011 with the Commission Decision (2011/833/EU), which established the EU Open Data Portal. Operated by the Publications Office of the EU from 2012 to 2021, it served as a central repository for open data from EU institutions, agencies, and bodies. In 2013, Directive 2013/37/EU refined the re-use of public sector information and promoted openness, amending the 2003/98/EC directive. This legal framework continued to evolve. The year 2015 saw the launch of the European Data Portal, expanding access to data from not only EU institutions but also national, regional, and local open data portals across Europe.

In 2019, Directive 2019/1024 became a significant step, recasting the PSI directive and setting minimum requirements for Member States to ensure the accessibility of public data resources. This strengthened the EU's commitment to open data. In 2020, the European Commission introduced the European strategy for data,



emphasizing the importance of data in enhancing Europe's global competitiveness. Finally, in 2021, a consolidation brought the European Data Portal and the EU Open Data Portal together into the data.europa.eu portal, simplifying access to open data from a wider range of sources. These developments underscore the European Commission's ongoing dedication to open data and its role in creating a more transparent and accessible data landscape in the EU.

The Data Strategy of the European Union, unveiled in 2020, aims to transform Europe into a prominent example of a data-empowered society, enabling improved decision-making in both business and the public sector. This strategy is underpinned by two key regulatory components to harmonize rules on fair access to and use of data: the Data Governance Act (DGA), introduced in 2020, and the Data Act (DA), proposed in 2022. These two acts are aligned in their goal of establishing a unified data market by enhancing data availability and promoting data sharing to enable data driven usage/applications that will benefit citizens and businesses.

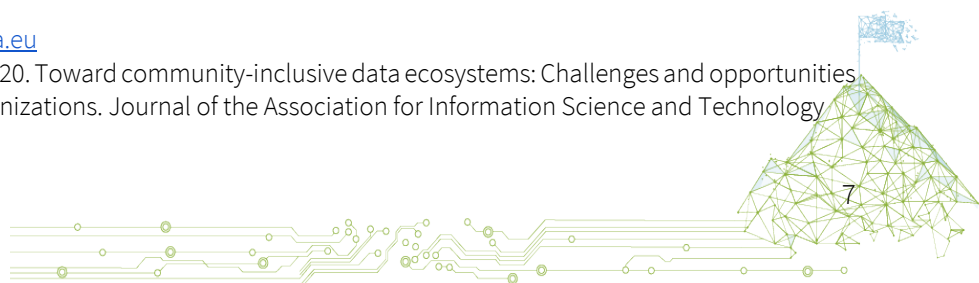
In next sections open and other -data approaches are described in the context of rural or mountainous areas.

3.1. Open data in rural communities

Unlike urban areas, availability, and access to data (especially open data) in rural areas seems to be lacking, and digital strategies often fail to address this, despite evidence showing that rural communities can significantly benefit from investments in the data economy (EU Commission 2020¹). The principle of open data, which is to make data openly usable to stimulate scientific, commercial, and community innovation, remains constant despite the variations in methodologies. While open government movements and data from the public and government sectors have been the driving forces behind many open data projects, open data also includes research and scientific data (especially data from public-funded research) and commercial (private) sector data that have both public and private value (Yoon and Copeland 2020²).

¹ [The Open Rural Data Gap | data.europa.eu](https://data.europa.eu)

² Yoon, Ayoung and Andrea Copeland. 2020. Toward community-inclusive data ecosystems: Challenges and opportunities of open data for community-based organizations. *Journal of the Association for Information Science and Technology*



In order to bridge the rural digital divide regarding open data, European Commission proposed several recommendations in order to increase knowledge about and offer solutions to address the gap between rural and urban communities (EU Commission 2020³):

- Support local champions as they build and institutionalize open data processes and practices in rural administrations.
- Emphasize the importance of the agricultural High Value Datasets (eg. agricultural trade statistics, the agricultural and rural development budget).
- Identify and assist a wider range of issues that are unique to rural areas (eg. emigration, health solutions capable of addressing the distance, food provenance).
- Create connections with urban regions through hubs or universities with related interests.
- Establish cooperative relationships with other data owners (NGOs, research centers, private companies) to enable the opening and sharing of data jointly.
- Invest in studying the fundamental characteristics of smart regions to identify key data to open and avoid using smart cities solutions without understanding rural-specific challenges.

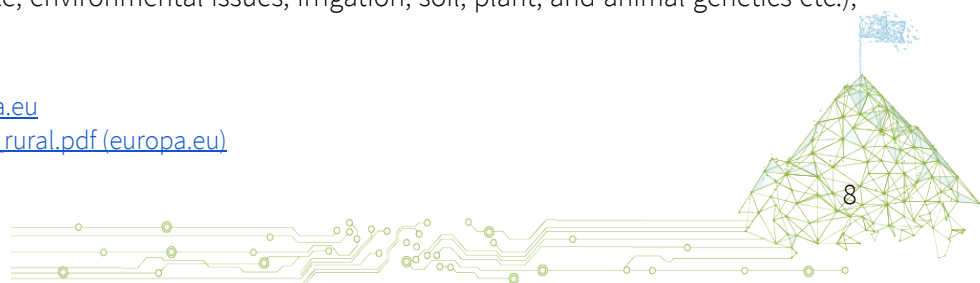
Walker et al. (2020⁴) in their Analytical Report 14: Enabling Smart Rural: The Open Data Gap defined two different types of rural data - rural population data and rural economy data.

Data on the rural population includes details on living and working in the area, such as housing (availability, affordability, condition), connectivity (broadband, mobile), material deprivation, access to transportation (public, shared), demographics, job types, wages, employment levels, and public services (access to healthcare, social care, education, welfare services etc.) (Walker et al. 2020).

Rural economy data concentrates on rural sectors including agriculture (which make up 47% of the EU's land area and 40% of its budget), forestry (which contributes 1% to the EU GDP), and fisheries (one of the most important investment areas for the EU's sustainability and growth). This data can include different types of growing conditions (weather, climate, environmental issues, irrigation, soil, plant, and animal genetics etc.),

³ [The Open Rural Data Gap | data.europa.eu](https://data.europa.eu)

⁴ [analytical_report_14_enabling_smart_rural.pdf \(europa.eu\)](#)



food provenance (where and how it has been grown, production, transport etc.) and supply chains (Walker et al. 2020).

In their study, Singh and Vipra (2019⁵) presented different types of community data. In addition to understanding collective social data on a certain group of people (community) as community data, they proposed another two types: data generated by objects and/or areas that belong to a community, such as public spaces and infrastructure and the second type of data which relates to geographic areas (territories) that are typically seen as a part of a certain community - this includes data on natural phenomena like climate and vegetation. These are all pieces of data that come from a certain social environment, inanimate surroundings, and/or natural ecology, all of which can be linked to specific communities (Singh and Vipra 2019).

3.2. Barriers to adopting data-based approaches

In the European Data Portal's Analytical report 5: Barriers in working with Open Data, Berends et al. (2020⁶) proposed that barriers can be clustered into six categories:

- Political: when open data is given priority by politicians and policy makers who include it in their plans, this priority must filter down to the administrations where it will be put into practice. Similarly, managers in the business sector could be hesitant to commit resources to researching the potential value of open data due to its novelty or lack of proven financial benefits.
- Organizational: Release of open data should be integrated into operational procedures with relation to the internal organizational structure. All participants in this process must be organized, fully informed and aware of their roles, while also considering external factors, like collaboration and interaction between the many open data stakeholders.
- Financial: release and publishing of open data requires financial resources. Some government departments might see moving towards open data as a potential loss (loss of revenue due to free access to data). Potential users/re-users of open data may also face financial limitations - free access

⁵ Singh, Parminder Jeet and Jai Vipra. 2019. Economic Rights Over Data: A Framework for Community Data Ownership. Development 62: 53-57

⁶ [edp_analytical_report_n5 - barriers_in_open_data.pdf \(europa.eu\)](#)

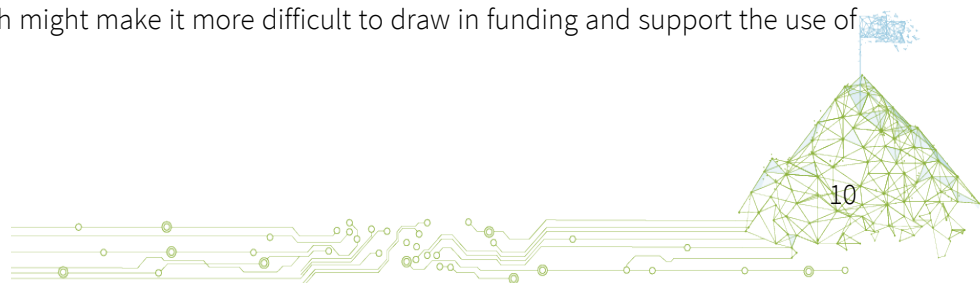


to data itself is not enough to convince users, since implementing it into various business cases still requires an investment.

- Legal: when working with open data, users must be aware of their rights to access the data and the restrictions that may apply, which means it should be obvious which permission applies to a dataset and what it allows. Legal frameworks in the EU can be constructed based on the PSI directive, but other places' legal bases might not be as clear and specific.
- Technical: main concerns from the technical standpoint are the availability of data, infrastructure and technologies that enable publishing and using open data. Working with open data also calls for specialized knowledge and abilities in the fields of IT, data processing, and data management, both on the supplier and user sides.
- Social (awareness): increasing awareness is essential to maximizing the potential of open data. Both data publishers and data users may not recognize the value and potential benefits - data publishers lacking awareness of the users' needs may create publication strategies unsuited to the demands of users, while data users may be unaware of the availability of specific open datasets.

More specifically, open data has a lot of potential to contribute to communities but faces various barriers, especially in rural settings and rural/remote communities where other factors, such as digital infrastructure and digital skills also come into play: (Yoon and Copeland 2020):

- Access to data - differences in digital infrastructures and in educational and financial resources that enable data can limit equal access to data by citizens (communities);
- Data usability - data is often siloed and hard to find and even though the government supplies the data, it lacks the funding or authority to make it useful.
- Data literacy - lack of the ability to successfully find, comprehend, gather, analyze, visualize, and use data in an ethical manner.
- Funding and support - specific context of local data can make it unscalable/not interoperable with other, bigger datasets, which might make it more difficult to draw in funding and support the use of local data.

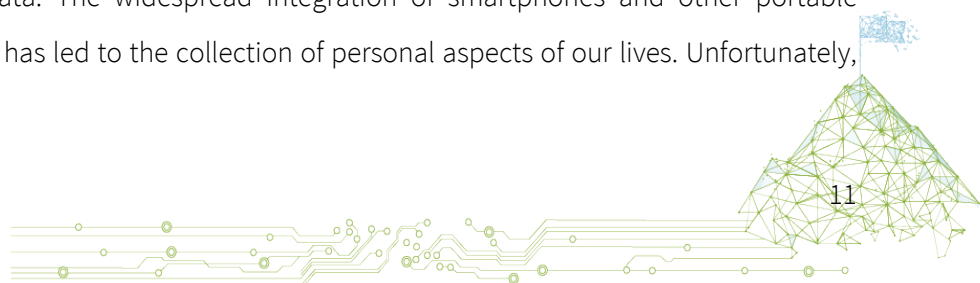


3.3. Overcoming the barriers - Data-based approaches

3.3.1. Data ownership

Singh and Vipra (2019) have defined a community as a group of different actors, social and economic, that have collective, shared interests regarding data and have common stakes in said data. They argue that communities should collectively own data about them, since the true benefit of such data and possibilities to utilize it pertains to that specific community. To further defend the argument in favor of communal ownership of data, Singh and Vipra (2019) stressed that the most significant value of data is collective rather than individual since data as a resource is non-rival, meaning that the more that it is shared, the more value it can create for society. In general, the community entity that is most directly linked to certain data should have the ownership over it through its appropriate governance structure. Apart from institutional factors, attention should also be directed to innovative technical solutions, business model development and different intermediary arrangements, all with the aim to support fair distribution of value provided by data and enforce collective ownership of data in practice. For example, a possible technical solution would be the use of APIs (application programming interfaces, that allow programmes to pull or push data from another programme/database (Singh and Vipra 2019)), while some possible solutions from the perspective of data management could be edge computing (distributed computing model, which allows some computing to occur at the edge of the network, closer to where data is being generated ([What Is Edge Computing? — Intel](#)) or federated learning (Singh and Vipra 2019). Federated learning is a machine learning approach that allows separating the capacity to do machine learning from the requirement to store the training data in the cloud ([Federated Learning: Collaborative Machine Learning without Centralized Training Data – Google Research Blog](#)).

Closely related to data ownership, the "Data colonization" refers to the phenomenon where governments, non-governmental organizations, and corporations assert ownership over and privatize data generated by their users and citizens. This dispossession can occur, for instance, through End-User License Agreements that enable the privatization of user data. The widespread integration of smartphones and other portable technologies into our daily routines has led to the collection of personal aspects of our lives. Unfortunately,



it's often the data producers (users, citizens, communities ...) who are deprived of their rights to own and control this resource.

3.3.2. EU Data Spaces

According to the vision outlined in the European strategy for data, the establishment of EU-wide common, interoperable data spaces in strategic sectors, such as health, energy, mobility, finance, public administration, skills, agriculture, and manufacturing, aims to remove legal and technological obstacles to data sharing by combining the required tools and infrastructures and tackling issues of trust through common rules (European Commission 2022⁷). These common European data spaces aim to be guided by the principles of data control (developing tools that make it easier for data owners to upload the data to data space, give or revoke permissions, update or change access rights and set guidelines for how data can be accessed or reused), governance (establishing governance structures, that guarantee equitable, open, proportionate, and nondiscriminatory data access, exchange, and use), respect of European rules and values, technical data infrastructure (stakeholders encouraged to use common technical infrastructure and components, that enable data spaces to be constructed effectively, in a coordinated way), interconnection and interoperability (avoiding fragmentation and data silos) and openness (all organizations or individuals who comply with EU norms and respect EU values are eligible to participate in common European data spaces). Establishing common rules makes it possible for data from all over the EU to be made available and exchanged in a reliable and secure manner (this includes data from research institutions, public administration, businesses, NGOs or individuals), and gives citizens and businesses control over data they produce, allowing them to feel confident in how it will be utilized to foster innovation (European Commission 2022).

3.3.3. CARE Principles for Indigenous Data Governance

In the context of a community-based data approach, it is worth mentioning principles that have been established for indigenous people's data governance. Indigenous data sovereignty has been established by the United Nations Declaration on rights of indigenous people, which promotes the idea of Indigenous authority over Indigenous data and reiterates the right of Indigenous Peoples to self-determination as political entities (Russo Carroll et al. 2020⁸). In practice, this means that Indigenous people have governance over all

⁷ [Staff working document on data spaces | Shaping Europe's digital future \(europa.eu\)](#)

⁸ Russo Carroll, Stephanie, Ibrahim Garba, Oscar L. Figueroa-Rodríguez, Jarita Holbrook, Raymond Lovett, Simeon Materechera, Mark Parsons, Kay Raseroka, Desi Rodriguez-Lonebear, Robyn Rowe, Rodrigo Sara, Jennifer D. Walker, Jane

data generated by them and all data that governments and other entities create/generate about them and their territories, as well as communities and individuals that reside in these communities (both indigenous and non-indigenous individuals) (Russo Carroll et al. 2020). Establishing principles for indigenous community data governance, CARE principles (Figure 1), which stands for collective benefit, authority to control, responsibility, and ethics (Russo Carroll et al. 2020) is crucial for empowering indigenous communities to take control over their data and create value for members of their communities, making sure they are not left behind in a fast-paced world of digital innovation.

These principles and the added value they can foster can also be considered for rural and remote communities, since they too can benefit from establishing their own data governance principles, to overcome the digital divide and ensure equal participation in the digital and data economy.

Anderson and Maui Hudson. 2020. The CARE Principles for Indigenous Data Governance. *Data Science Journal* 19(43): 1-12.



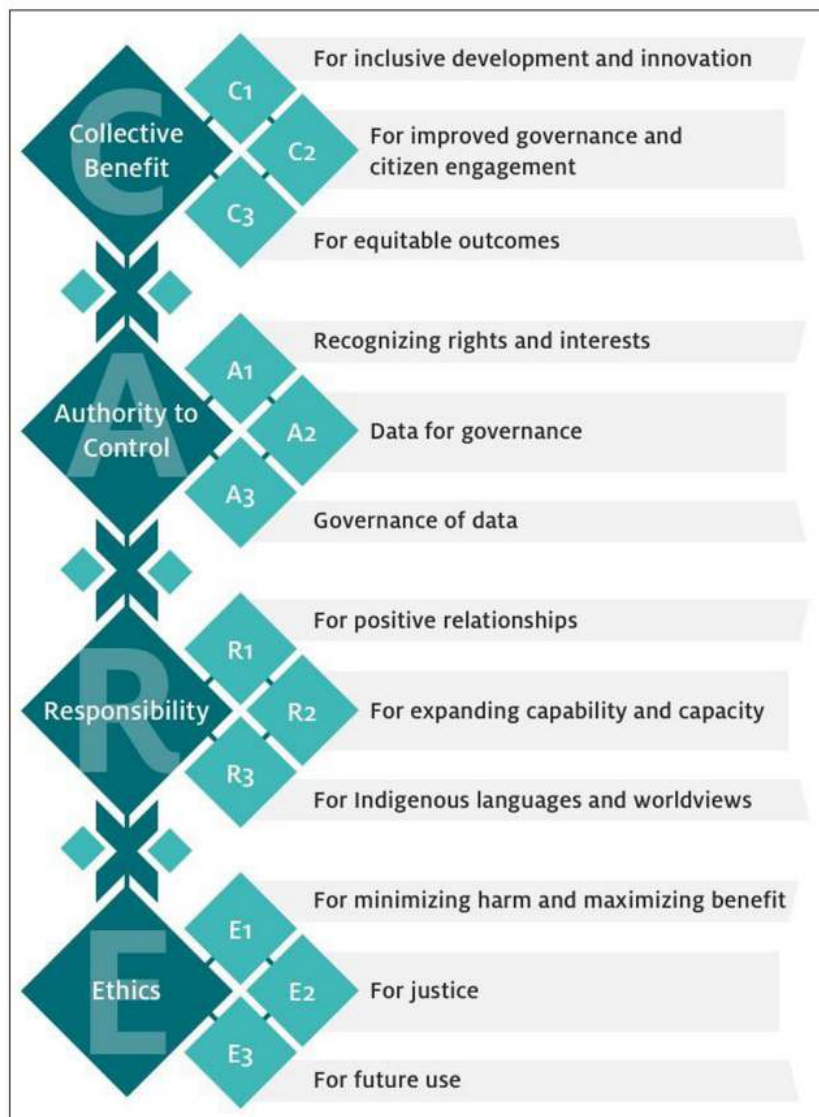


Figure 1 - CARE principles for digital and data economy

from Russo & Carol et. al, 2020

3.3.4. Data stewardship

Data stewardship is a term used for a group of activities that are aimed at ensuring that the correct data is provided to the correct processes in the right format and that it complies with all applicable rules and regulations. It involves assuming ownership of the data and planning the essential activities for data exchange



processes (Van Donge et al. 2022⁹). Stewardship, as stated by Dawes (1996¹⁰), is a decentralized and dispersed set of obligations rather than one with a central authority, which Van Donge et al. (2020) have viewed as an appropriate approach for data ecosystems in which there is a lot of cooperation between public and private organizations, that usually have different objectives and responsibilities. Data ecosystems are characterized by various participants that are connected (private and public organizations) in creating value, thus requiring a different approach than single organizations - collaborations are decentralized, relying on horizontal relationship and governance (Van Donge et al. 2022). Such an approach might also be useful in the community setting (especially rural/remote communities benefit from decentralized, bottom-up approaches). In this sense, data stewards could take the responsibility of approaching the community members and working closely with them to identify their needs and priorities, understand them and proceed to design appropriate solutions. They can also foster awareness raising and empower communities to take control of their data and utilize it to enable community development and impact policy makers.

3.3.5. Rural DIHs

Rural digital innovation hubs have been proven to be important facilitators of digitalization in rural areas. As stated by Stojanova et.al. (2022¹¹), the actions of rural DIHs range from advocating for access to funding opportunities, conducting market research, networking with other regions, engaging in bottom-up co-creation processes, integrating policies, and making recommendations to developing technical solutions. Previous research has confirmed that rural DIHs may successfully handle the issue of connectivity and digital skills, and most importantly, they can provide community training spaces for promoting digital inclusion, which is why it is also important to stress that more work needs to be put into these DIHs (Stojanova et al. 2022), and the European Commission has already acknowledged the significance and importance of DIHs and regarded them as essential to the development of local and regional data ecosystems. This can be seen as an opportunity to

⁹ Van Donge, W., N. Bharosa, M.F.W.H.A. Janssen. 2022. Data-driven government: Cross-case comparison of data stewardship in data ecosystems. *Government Information Quarterly* 39.

¹⁰ Dawes, S. S. (1996). Interagency information sharing: Expected benefits, abstract. *Journal of Policy Analysis and Management* 15(3): 377–394.

¹¹ Stojanova, Simona, Nina Cvar, Jurij Verhovnik, Nataša Božić, Jure Trilar, Andrej Kos and Emilija Stojmenova Duh. 2022. Rural Digital Innovation Hubs as a Paradigm for Sustainable Business Models in Europe's Rural Areas. *Sustainability* 14.



strengthen the role of DIHs in rural areas and employ them also in the co-creation of a suitable community-based data approach.

3.3.6. Living Labs

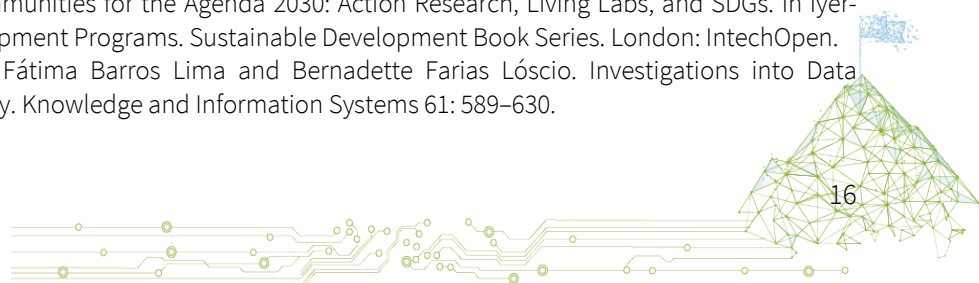
Living labs are collaborative environments where different stakeholders, such as researchers, local businesses, local communities, and governments work together in order to come up with solutions for ongoing challenges, for example, they create different prototypes and test cutting-edge responses to current societal problems (Calzada 2023¹²). Calzada (2023) further elaborates how living labs empower participants to collectively reflect on their own living and working conditions, both current and future oriented. To support this process, participants rely on various research methods, such as in-depth interviews, focus groups, visual ethnography etc. Through these processes members of the communities can unlock their potential to create new business models and accelerate entrepreneurship in the area, while being continuously supported by experts, technical professionals, and scholars (Calzada 2023). Living lab approach can have a significant role also in the local data economy, through collective effort to include community members into the process, allowing them to participate in value co-creation and reaping the benefits of their own local data.

3.3.7. Data ecosystem awareness

S. Oliveira, Barros Lima and Farias Lóscio (2019¹³) have defined data ecosystems as complex socio-technical networks where different stakeholders connect and work together to publish, use, reuse and archive data, simultaneously promoting and fostering innovation, creating value and supporting business and entrepreneurial endeavors. Europe appears committed to taking the lead in the discussion of citizens' digital rights by experimenting with data ecosystems (European Commission, 2020). This strategy aims at establishing an agenda that revolves around seeking for ways to take advantage of the favorable technological and political circumstances and also empower European citizens, public authorities and businesses through an agile approach to data, that reflects the needs of a variety of stakeholders and is in line with European

¹² Calzada, Igor. 2023. Smart Rural Communities for the Agenda 2030: Action Research, Living Labs, and SDGs. In Iyer-Raniga, U. Contemporary Rural Development Programs. Sustainable Development Book Series. London: IntechOpen.

¹³ Oliveira, Marcelo Iury S., Glória de Fátima Barros Lima and Bernadette Farias Lóscio. Investigations into Data Ecosystems: a systematic mapping study. Knowledge and Information Systems 61: 589–630.



values (Calzada and Almirall 2020¹⁴). Calzada and Almirall (2020) have proposed three main priorities that can serve as a kind of a roadmap for regional and local governments which are looking to establish data ecosystems and protect the digital rights of their citizens:

- Advocacy - European regions and cities need a more organized approach to a common dialogue to openly discuss and address ongoing issues among different stakeholders, while having the opportunity to be more effectively connected to European policymakers.
- Governance - there is a need to address the lack of applied research in policy as well as a lack of guidance, particularly in contemporary fields of AI, data spaces and digital transformation.
- Pan-European agencies - this refers to a need for establishing common agencies, that can be either public, private or in a form of partnerships, to further promote the use of open-source software and standardization, with the aim to mobilize available capacities in software development, AI and data analytics and to put them at service of European regions and cities.

3.3.8. EU Data Spaces

The European data strategy¹⁵ seeks to establish a unified data market to enhance Europe's global competitiveness and maintain data sovereignty. Through the creation of shared European data spaces, the objective is to increase the accessibility of data for economic and societal purposes while ensuring that the entities and individuals generating the data retain control. Data stands as a fundamental asset for driving economic growth, competitiveness, fostering innovation, creating jobs, and advancing society as a whole.

To further ensure the EU's leadership in the global data economy the European strategy for data intends to:

- adopt legislative measures on data governance, access, and reuse. For example, for business-to-government data sharing for the public interest;
- make data more widely available by opening up high value publicly held datasets across the EU and allowing their reuse for free;

¹⁴ Calzada, Igor and Esteve Almirall. 2020. Data ecosystems for protecting European citizens' digital rights. *Transforming Government: People, Process and Policy* 14(2): 133-147.

¹⁵ A European Strategy for data: <https://digital-strategy.ec.europa.eu/en/policies/strategy-data> (accessed on 8.6.2023)



- invest €2 billion in a European High Impact Project to develop data processing infrastructures, data sharing tools, architectures and governance mechanisms for thriving data sharing and to federate energy-efficient and trustworthy cloud infrastructures and related services;
- enable access to secure, fair, and competitive cloud services by facilitating the set-up of a procurement marketplace for data processing services and creating clarity about the applicable regulatory framework on cloud framework of rules on cloud.

The initial set of Common European data spaces includes:

- An Industrial data space, geared towards bolstering the competitiveness and performance of the EU's industry.
- A Green Deal data space, aimed at harnessing the vast potential of data to support Green Deal priority initiatives addressing climate change, circular economy, pollution, biodiversity, and deforestation.
- A Mobility data space, with the goal of positioning Europe as a leader in developing intelligent transport systems.
- A Health data space, seen as vital for advancements in disease prevention, detection, treatment, and informed decision-making to enhance healthcare systems.
- A Financial data space, intended to drive innovation, promote market transparency, sustainable finance, and facilitate access to finance for European businesses, fostering a more integrated market.
- An Energy data space, with the aim of facilitating greater availability and cross-sector data sharing in a secure and trustworthy manner, with a focus on customer-centric solutions.
- An Agriculture data space, designed to enhance the sustainability and competitiveness of the agricultural sector through data processing and analysis.
- Data spaces for Public Administrations, geared towards enhancing transparency and accountability in public spending, ensuring spending quality, and combating corruption at both EU and national levels.
- A Skills data space, focused on reducing skill mismatches between education and training systems and the labor market's demands.



4. Good practices - using the open data

To better highlight the value of open data and the opportunities it can present, we are providing several real-world use cases from Europe and beyond.

4.1. Estonia: Air quality open data dashboards

In Estonia, the Estonian Environmental Research Centre developed the air quality portal, where individuals can view interactive dashboards that display real-time measurements of ambient air pollution concentrations and projected air quality values for major cities. The observed levels are assessed along with pollutant concentrations on a scale of very good, good, medium, bad, and very bad. Users can get the source data from the air quality website, which also enables access to the underlying data.

More information:

- [Open Data Best Practices in Europe Estonia Slovenia and Ukraine.pdf \(europa.eu\)](#)
- [Air Quality Management System \(ohuseire.ee\)](#)

4.2. Slovenia: Public budget spending overview

In Slovenia, the 'Budget of the Republic of Slovenia' was made public in January 2020. The interactive visualizations make it simple for citizens to keep track of the state's income and outlays as well as to get more detailed data on the projects that are supported or co-financed with public money. This is a key step towards more transparency in the utilization of public sector budgets because it gives the user a deeper understanding of a particular budget expenditure area and allows searching for data by region, municipality, or project value.

More information:

- [Open Data Best Practices in Europe Estonia Slovenia and Ukraine.pdf \(europa.eu\)](#)
- [Državni proračun \(gov.si\)](#)



4.3. Ireland: Cork Data Dashboard

Ireland's municipality of Cork created an open data dashboard where a sizable amount of public data, including specifics about the weather, traffic, and air quality, is available for free access through an online database called Cork Data Dashboard. Data is available for use to citizens, governments, and businesses. Cork Dashboard gathers data from a number of sources, including local and regional organizations, the Irish Transport Agency, the Central Statistical Office, and several governmental organizations. The platform was developed using open-source software, which may be used for free in other cities as well.

More information:

- [Open data in Cork, Ireland \(4PDIH\)](#)
- [Dublin & Cork Dashboards | Building City Dashboards \(maynoothuniversity.ie\)](#)

4.4. Netherlands: Open Science programme

In the Netherlands, the Amsterdam University of applied sciences has created the Dutch national programme called Open Science. By making scientific knowledge accessible, public, and reusable, Open Science strives to promote scientific collaboration and information exchange for the benefit of both science and society. It allows for the reuse of scientific output by academics, practitioners, teachers, and members of the general public. Additionally, it encourages intergroup cooperation and participation through initiatives that involve citizen scientists and engagement with the general public. Verification of discoveries is made possible by the ability to test open results, as well as the materials and procedures that support them, which raises the standard of research and education as a whole.

More information:

- [Open Science – Nationaal Programma Open Science](#)
- [Open Science at the Amsterdam University of Applied Sciences - AUAS \(amsterdamuas.com\)](#)



4.5. Estonia: Education Statistics Portal

Another example from Estonia is The Estonian Education Statistics Portal, also known as Haridussilm. This platform offers information on elementary, general, secondary, vocational, and higher education institutions. Additionally, it keeps track of other indicators, including data on the labor market and the effectiveness of lifelong learning. Policymakers and other stakeholders in the education sector can use the platform as a tool to track and evaluate the goals of their educational strategy. Users can dynamically create statistics reports and compare metrics like exam outcomes or student satisfaction scores between several institutions. Information on all educational levels is available on the platform, along with a variety of performance metrics. Data is retrieved from Estonia's national open data portal.

More information:

- [Data Europa \(europa.eu\)](https://europa.eu)
- [Haridusandmete portal | haridussilm.ee](https://haridussilm.ee)

4.6. Brazil: Educational management system

In Brazil, a website called QEdu was created for those who utilize, work in, or make decisions about education policy because it offers reliable information that educational management can use to reform educational systems. The purpose of QEdu is to make educational data open, easily accessible, and understandable. Prova Brasil, Censo Escolar, Ideb, and Enem from the Brazilian Ministry of Education are just a few of the databases that QEdu uses to monitor educational achievements. The datasets used to assess the effectiveness of the Brazilian educational system are particularly significant.

More information:

- [Data Europa \(europa.eu\)](https://europa.eu)
- [QEdu - Use data. Transform education](#)



4.7. International: OpenStreetMap

Another interesting example is a global project called OpenStreetMap. An international community of mapmakers created OpenStreetMap with the goal of gathering and maintaining data about roads, trails, cafes, train stations, etc., supplying map data for multiple websites and apps. The contributors to the map include amateur mapmakers, GIS specialists, engineers, those who map disaster-affected areas for humanitarian reasons, and many more. An open license makes use of it free of charge.

More information:

- [OpenStreetMap](#)

4.8. International: Europeana cultural heritage data space

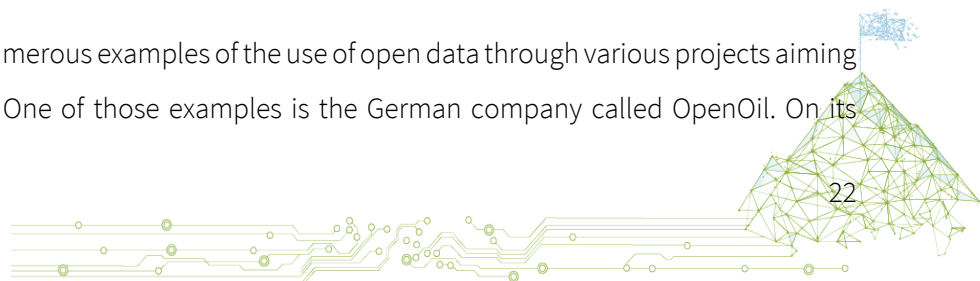
Another international open data project is the Europeana project. The European Commission launched the shared European data space for cultural heritage with the goal of enabling the digital transformation of the cultural sector in Europe and promoting content production and reuse in the creative and cultural industries. Academics, teachers, professionals, and enthusiasts of all kinds have access to digital copies of European cultural heritage items thanks to Europeana, which relies on a large number of European art galleries, libraries, archives, and museums that share their collections and data with users.

More information:

- [Projects | Europeana Pro](#)
- [Discover Europe's digital cultural heritage | Europeana](#)

4.9. International: OpenOil for managing natural resources

In the business sector, we can find numerous examples of the use of open data through various projects aiming to support SMEs and corporations. One of those examples is the German company called OpenOil. On its



platform, the company collects and offers information from a variety of organizations, including the government, oil companies, NGOs, and others. The company's goals are to create an open data framework for managing natural resources (such as oil), to provide services that increase resource management transparency, and to provide a cost-benefit analysis of the many industry sectors. They provide a variety of services, including financial analysis of major oil and mining firms as well as training and consulting to governments, businesses, NGOs, and international organizations.

More information:

- [Open Oil: A website that provides information about oil | data.europa.eu](https://data.europa.eu)
- [OpenOil](#)

4.10. Finland: Energia energy open data

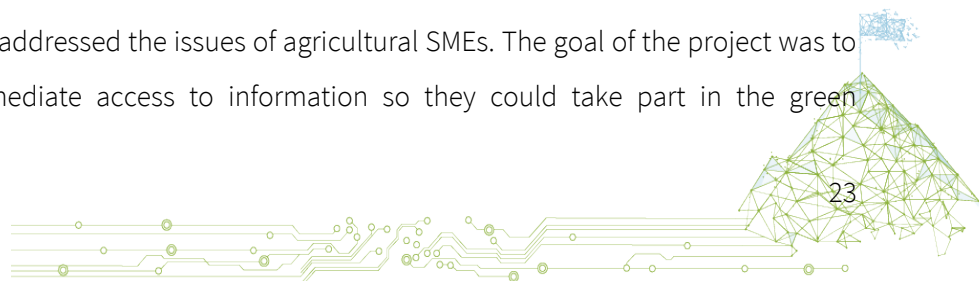
Finnish Sun Energia is another example of how businesses can utilize open data. Sun Energia is a company that analyzes energy output and suggests potential savings for houses and buildings using energy data, including accessible meteorological and weather data. For instance, based on data evaluations of the solar energy production of buildings and residences, Sun Energia can advise clients on how many solar panels they will need for their home in order to save energy and money.

More information:

- [Sun Energia \(europa.eu\)](https://europa.eu)
- [Frontpage - Sun Energia](#)
- [Open energy data on the European Data Portal | data.europa.eu](https://data.europa.eu)

4.11. Spain: Dataseeds agricultural portal

In Spain, the project Dataseeds has addressed the issues of agricultural SMEs. The goal of the project was to give agricultural-related SMEs immediate access to information so they could take part in the green



restructuring of EU industry. As a result, an online platform was developed that enables users to analyze historical data from the EU, consider current legislative and non-legislative actions taken by the EU, and create future solutions with the help of research organizations that concentrate on related problems. The European Data Portal provides access to 90,883 datasets that, if utilized properly, might help SMEs be more competitive and sustainable.

More information:

- [Dataseed \(europa.eu\)](https://dataseed.europa.eu)
- [About \(dataseeds.github.io\)](https://dataseeds.github.io)

5. Open data for the benefit of SmartCommUnity test areas

The aim within WPIT is to interconnect all pilot areas with an online platform for networking, exchange of knowledge, practices and advice between (digitally) more advanced test areas that have already completed the smart transition and those that are just embarking on this journey and would like to as soon as possible achieve results seen in more advanced. An important addition to the online platform will also be the display of collected data (sensor or other) from the included test areas.

5.1. Representation of Community Data

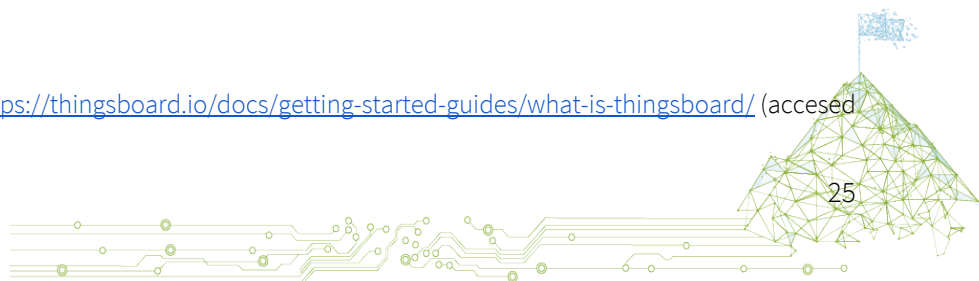
Community data, stored in local or cloud repositories serves as the foundation of representation in user interfaces. This data, contributed by the communities (i.e. test areas), fuels the insights and information available to users. These modes, with which the user accesses the data, utilize community data to empower users with valuable insights, foster collaboration, and facilitate access to the wealth of knowledge and information contributed by the community. They are current, dynamic, adaptable, and user-centric, providing an inclusive and interactive environment.



User interfaces that harness community data, consist of various elements that play a role in ensuring effective engagement and interaction. Essential modes of access and representation in the context of Innovation Platform for Smart Communities being developed, can be:

1. An application programming interface (API): API access is essential for providing structured, documented, and efficient access to the data stored in repositories and is a foundation on which to build and test new digital solutions or to analyze these data with advanced statistical methods. Several API engines or platforms are available. Among others, popular for sensor infrastructure, ThingsBoard¹⁶ is an open-source IoT platform that enables rapid development, management, and scaling of IoT projects. It provides the out-of-the-box IoT cloud or on-premises solution that enables server-side infrastructure for IoT applications.
2. Dashboards: Dashboards offer users a dynamic, visual overview of community data. They present data in an easily digestible format, allowing users to explore trends, patterns, and relevant information from test areas at a glance. The data can be presented in graphical, text, or other manner.
3. Widgets: Widgets are small, interactive elements that can be embedded within websites or applications. They provide real-time data or updates from the community, enabling users to access specific information or functionality without leaving the interface. These features can be used to enhance test area online information pages.
4. Conversational AI Interfaces: Conversational AI interfaces, such as chatbots or virtual assistants, provide a natural and user-friendly way to build and access the community knowledge base. Users can ask questions, seek information, or even contribute to the community's knowledge base through these interactive conversational tools. With the advent of Large Language Model (LLM) systems, specifically Chat-GPT (3, 4...), the changes in usage patterns of online tools are emerging, and some users might prefer searching the information through such interfaces, instead of website navigation structure or website search.
5. Inter-Interactive Actuators: while not widely used in digital platforms, actuators can be incorporated to enable user or machine interaction with the community data in physical space.

¹⁶ThingsBoard: What is ThingsBoard: <https://thingsboard.io/docs/getting-started-guides/what-is-thingsboard/> (accessed on 18.8.2023)



5.2. SmartCommUnity test areas data display ideas

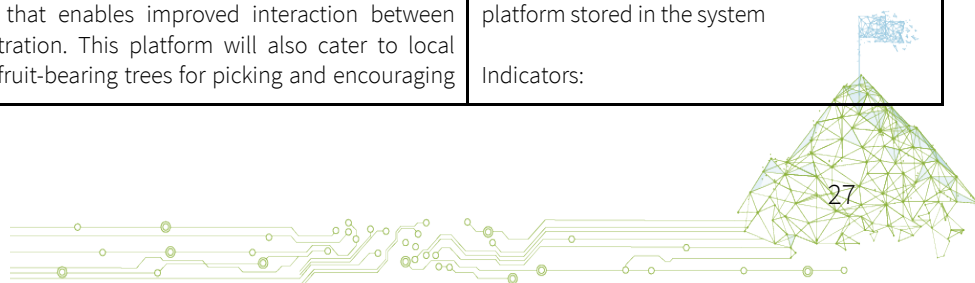
To enable the data approaches to connect the communities in/between test areas the WPTAN leads supported WPIT efforts to collect ideas and plans on how to collect and present the data in public online platforms through surveys distributed among the SmartCommUnity consortium members in June and July of 2023. The survey was collected in August from partners' each test areas (LTAs and FTAs) and the results on service proposals, data-collection methods and possible graphical or text representation of data from various sources, sensor on non-sensor based are presented below.

Table 1 describes the test areas solution (public services) in relation to possible implementations of data-based community approach including ideas for input modes, indicators from the perspective of service users and managers. Since this is the ideation phase, the service description does not include location (test area) information, and only includes the responses with enough insights.

Table 1 - SmartCommUnity test areas' services, inputs indicators and visualization ideas.

Service	Service description <ul style="list-style-type: none"> - Service users - Service managers 	Inputs, Indicators, Visualization Ideas
<i>Housing information and networking</i>	The proposed services aim to address housing and caregiving challenges. The focus for housing involves engaging secondary residence owners and housing professionals (associations, estate agents) to establish a collaborative network for improving housing availability. For elderly care, the goal is to unite professional caregivers through a network. The purpose of these efforts is to enhance understanding of service offerings and usage. The service manager, employed by a local authority, seeks to overcome population outreach and information dissemination issues. They aim to better comprehend user demographics and adjust objectives if they are not met.	Inputs: Manually entered data Indicators: Dissemination reach, number of stakeholders involved Visualization: Dashboard, numeric(%), contextual (AI chatbot)
<i>Mobility central</i>	The envisioned service caters to a diverse user base, including the elderly needing transport, youth heading to train stations, tourists seeking park information, and local employees looking for alternative travel options. The objective is to surpass current target groups categorization and ensure services are universally accessible. The mobility center will exist digitally (website and app) and maintain a B-to-B section for those with literacy challenges. The primary goal is to enable unique travel experiences and information access. The service manager, a local authority employee, seeks usage data (frequency, time spent, tab preferences), qualitative feedback (comments), and overall assessment (positive/negative) of the service's impact.	Inputs: Manual process or platform data Indicators: No. of users in the mobility platform, distances (km) covered, services provided, dissemination reach. Visualization: Dashboard, numeric (%), contextual (AI chatbot)

<p>Climate change awareness campaigns</p>	<p>The service maintains strong interaction with users through events like expert lectures and the "Climate and Me" exhibition. Each test region is managed by a KLAR Manager, responsible for public relations actions. People in these areas are well-informed about climate change and adaptation.</p> <p>Activities include a touring climate exhibition, numerous municipal events, natural hazard assessments, and a collection of best practice examples from Lower Austria. A new website, "klimafit-noe.at," will provide climate adaptation measures for test areas, with traffic measurement.</p> <p>KLAR Managers play a pivotal role in local climate change adaptation. They handle climate analysis, risk assessment, strategy development, awareness campaigns, collaboration, project management, and progress monitoring. Workshops, lectures, and exhibitions engage stakeholders, with input from end-users to tailor activities effectively.</p> <p>Managers gather feedback through surveys, meetings, and online platforms, shaping strategies to address community needs. The service enhances managers' expertise, fosters engagement, and develops leadership skills, contributing to their reputation as climate resilience advocates.</p>	<p>Inputs: Given the focus on soft skills, data collection relies on manual input by managers periodically to capture nuanced development aspects, as sensor-based or digital data collection isn't applicable.</p> <p>Indicators: Number of events, dissemination reach, number of best practices collected.</p> <p>Visualization: Contextual (AI chatbot)</p>
<p>Living Lab on circular food supply chain</p>	<p>Green Point LL caters to diverse end-users including public institutions, the HORECA sector, civil society, and potentially bioeconomy SMEs involved in zero waste and circular food supply chains. A key aim is to enhance transparency in food origins and production for food safety while supporting rural economies and environmental health.</p> <p>The service will expand the Greenpoint online marketplace, offering a peer transportation service for food orders and surpluses. This approach connects producers and consumers, minimizing supply chain food loss and enabling new revenue streams. Goals include marketplace expansions, numerous transport service providers, end-user testing, bioeconomy SME collaborations, and customer satisfaction surveys.</p> <p>The service also involves co-creation workshops, a communication plan, and promotional events. It strives to address the transformation of food systems by enhancing connectivity, reducing waste, and fostering collaboration between various stakeholders.</p>	<p>Inputs: Data will be collected via digital platforms and periodically via surveys.</p> <p>Indicators: No. of services provided, No. of value-chain stakeholder participating, dissemination reach, No. of events.</p> <p>Visualization: Dashboards, numeric (%), diagrams</p>
<p>Community building and cultural heritage</p>	<p>Exploring the possible interactions between older and newer generations to defend and hand down the cultural heritage of communities through digitization supporting older population groups in using new digital technologies and access to public authority services.</p>	<p>Inputs: Content material used for trainings and cultural heritage digitalization.</p> <p>Indicators: No. of target group participants, number of events, Number of cultural heritage items</p> <p>Visualization: Dashboards, numeric (%), Contextual (AI chatbot)</p>
<p>Integrated online Municipality platform (training hub, public services, multipurpose physical spaces)</p>	<p>The goal is to enhance overall quality of life and increase citizen engagement in daily activities. Through accessible digital solutions, all citizens will be connected, fostering unity, simplifying tasks, saving time, and promoting safety and eco-friendliness. The focus is on developing a communication platform that enables improved interaction between citizens and city administration. This platform will also cater to local needs, such as indicating fruit-bearing trees for picking and encouraging</p>	<p>Inputs: Most data can be collected or manually measured and entered by those responsible at regular intervals e. g. Registrations for the platform stored in the system</p> <p>Indicators:</p>



	<p>citizens to participate in tasks like watering public greenery if sensor technology is involved.</p> <p>The project's objective is to establish a strong connection between citizens, administration, and tourism. By motivating citizens to participate actively, the community's intelligence and resilience will be enhanced. The central aim is to create a more interconnected and resilient community through meaningful participation in actions that improve daily life and align with environmental goals</p>	<p>Number of persons who have registered for the platform/are using the platform.</p> <p>Number of kicks for video tutorials for older people</p> <p>Number of retrievals of the "New Citizen Journey"</p> <p>Number of persons who access data from the sensors.</p> <p>Number of people who use a co-working space.</p> <p>Visualization: Dashboards, %, diagrams</p>
Sensor and data platform	<p>Real-time analysis of data collected from community buildings. This should enable cost-efficient work and provide a better basis for decision-makers.</p>	<p>Inputs: Sensor data</p> <p>Indicators: Energy (kWh) usage, locations/stakeholders involved.</p> <p>Visualization: Dashboards, numeric (%), diagrams, actuators usage possible</p>

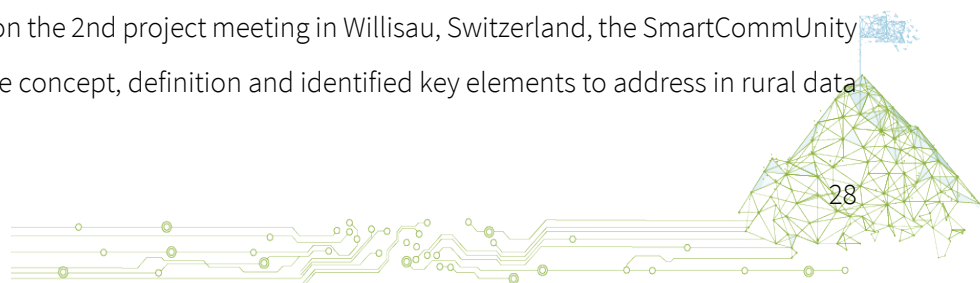
The insights of the survey will be useful in designing online Innovation Platform, in part where it includes community data from designated test areas.

6. Guidelines for Community-Based Data Approach

Building on understanding of existing definition of Smart Communities:

Smart communities are communities of people, in mountain or rural areas, that are proud and aware of their identity, their territory, their craftsmanship, their products and their close-knit social fabric, and that want to become active players in determining their own future, owning, and driving the changes that the future, and any digital transition, may entail. Smart communities are open to innovate, to learn and to inspire, and to work holistically towards smart and green rural and mountain areas, that are lively and lived, that aim to become carbon-neutral and that can be or become attractive to live and work for all age groups.

...and through workshop activities on the 2nd project meeting in Willisau, Switzerland, the SmartCommUnity partners discussed the viability of the concept, definition and identified key elements to address in rural data management.



6.1. Definition of Community-Based Data Approach

Short definition proposal:

Community-Based Data Approach involves actively engaging a Smart Community in the collection, analysis and utilization of data to address local issues and needs. The community understands that data is an asset and means to facilitate its autonomy in leveraging smart solutions development and future uses.

6.2. Elements of Rural Data Management

Discussed in the workshop, these elements were identified as essential for effective rural data management, allowing rural communities to harness the power of data for their development and decision-making processes while maintaining control and privacy over data.

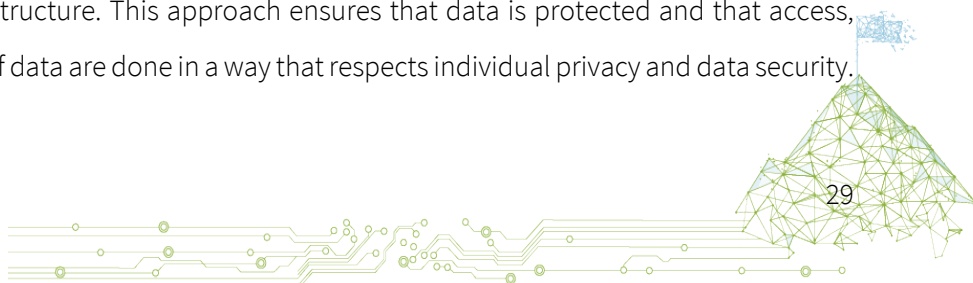
Data Awareness: The understanding of the importance of data in decision-making and the acquisition of skills to use data effectively to inform decisions. This awareness ensures that rural communities recognize the value of data in improving their living conditions and agricultural practices.

Data Readiness: Data readiness refers to the ability of rural communities to collect, curate, and utilize data for both operational and analytical (including AI) purposes. It involves having the necessary infrastructure and knowledge to handle data effectively.

Open Data: Open data initiatives involve making data accessible to citizens and businesses, allowing them to benefit from data-driven applications. It emphasizes the importance of harmonized rules for fair access to and use of data throughout rural areas, promoting transparency and innovation.

Interoperability: Interoperability is a key component of the EU framework for data exchange, e.g. EU Data Spaces and other initiatives. It ensures that different data systems and platforms can seamlessly work together, enabling rural communities to share, process, and use (external) data effectively.

A Secure and Privacy-Preserving Infrastructure: Rural data management should prioritize the establishment of secure and privacy-preserving infrastructure. This approach ensures that data is protected and that access, sharing, processing, and utilization of data are done in a way that respects individual privacy and data security.



Retain Community Data Autonomy / Sovereignty / Ownership: To avoid data colonization and maintain control over their own data, rural communities must retain data autonomy, sovereignty, and ownership. This principle empowers them to make decisions about how their data is used, shared, and managed, ensuring that data benefits the community rather than external entities.

6.3. Rural Data Steward role

The introduction of advanced digital tools, various data-related concepts, and EU frameworks for wider use in rural environments presents quite a few challenges. In addition to the fact that it is necessary to build and strengthen the data ecosystem, since data is not really lying around, one of the key challenges is digitization or more broadly, digital transformations lack of advanced digital knowledge and skills for users, especially for managers of such systems.

In the framework of the SmartCommUnity project, we intend to overcome this gap through the evolution of the role, i.e. Data Steward, which is a well-established concept in European data initiatives, comes from and is embedded in the local environment, knows and takes care of the local sensor and digital infrastructure, can interpret digital challenges and concepts to the local environment, and at the same time knows how to transfer needs local environment to regional or national research and innovation junctions for the development of future solutions. At the same time, it recognizes the value of data ecosystems for the future development of solutions, which are based on the analysis of collected data and will improve the quality of life in rural and mountainous areas and care for the autonomy of the local environment with regard to data (to avoid data colonization).

In the vision of the SmartCommUnity consortium, Rural Data Steward would be working closely with regional or national Research and knowledge Hubs, which provide training and guidelines for working in the local and global data ecosystems. Research and knowledge hubs, i.e. universities, regional development centers, research and technology institutions usually have the capacity to be integrated into wider data initiatives, EU networks etc., while possessing enough expertise to support the rural data stewards with general guidelines, good practices and approaches. This deliverable offers the foundation platform for starting-up these activities.



6.3.1. Rural Data Steward workshop results

Somewhat evolving the existing SmartVillages “local heroes” concept, this new role was proposed as to become a contact point for everything data and digital related in a smart community, a true “*digital* local hero”. Since it carries a lot of similarities with existing EU data concept of “Data Steward”, it made sense to retain the connection to the original terminology - though “Data Steward” does not translate well into local languages of partners’ countries - it remains as it and will probably be translated to local languages by other entities responsible for digital transformation on national level. Nevertheless, the exercise of finding a better term for this role has been conducted in the workshop on 13.9.2023 in Willisau, Switzerland, where participants have been asked:

1. What does a rural data steward mean to you? Think about:
 - Who is a rural data steward?
 - What is her/his role?
 - What is the relationship between the rural data steward and community?
2. Suggest another name for a rural data steward.

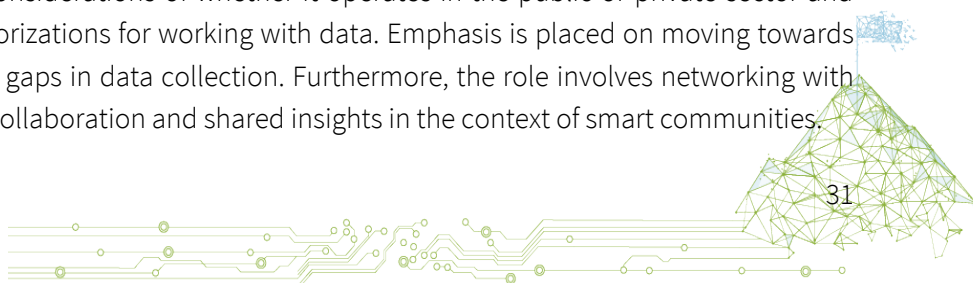
Workshop results for the first question are summarized in next paragraphs.

A data steward, in essence, is an individual who possesses a deep understanding of their community's needs and has a keen awareness of available data resources and their sources, often through knowledge transfer offices or well-connected individuals. They play various roles, including data collection and distribution for new services, organization of stakeholders, coordination of activities, and serving as an observer. Moreover, they shoulder the responsibility for facilitating the digital transition of their area.

The core function of a data steward is to explain to the community the significance of data and its role in improving the community's well-being. They provide an overview of available technological solutions and use data to benefit the people, demonstrating what is possible and communicating positively. As a trustworthy figure, they aid in making sound decisions.

In the context of smart communities, a data steward plays a pivotal role in bringing people together, collecting their data, and guiding them in effectively working with that data.

Dependencies in this role include considerations of whether it operates in the public or private sector and addressing the critical point of authorizations for working with data. Emphasis is placed on moving towards open data practices and addressing gaps in data collection. Furthermore, the role involves networking with different data stewards to facilitate collaboration and shared insights in the context of smart communities.



Possible alternative names propositions for “rural data steward” were: technology transfer officer, digital facilitator, data butler, guardian of the data galaxy, rural data manager, local data consultant, digital intelligence officer.

6.3.2. Rural Data Steward diagram

Outlining the role of the data steward in the context of community-based data approach has been represented in the Figure 2 diagram.

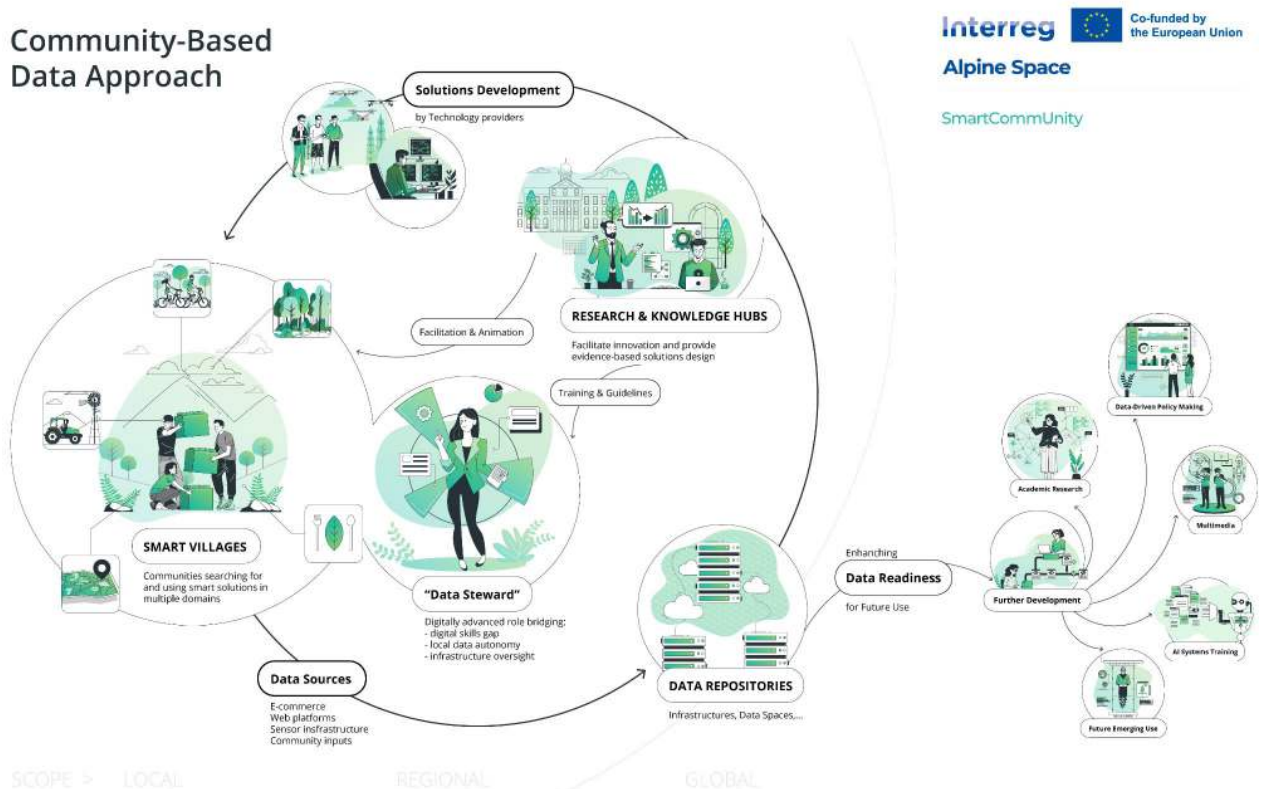


Figure 2 - In the SmartCommUnity project, we try to enhance local, autonomous data ecosystems through the role of a "data steward" - a local digital hero.

diagram author Jure Trilar, 2023

As shown in Figure 2:

At local level the Smart Villages/Communities are searching for and using smart solutions in multiple domains (in Smart Dimensions). In the local context the Data steward is a digitally advanced role to overcome digital skills gap, local data autonomy and oversee the digital, sensor infrastructure.



Various data sources, such as e-commerce, web platforms, sensors and community inputs are stored in local, decentralized or cloud data repositories (preferably under EU frameworks). This data is in a local-regional context used for academic research by regional/national research and knowledge hubs (i.e. universities, regional development agencies, other research and technology organizations) to enable future evidence based solutions design. These solutions are then, by request and with coordination with smart communities developed by different technology providers to benefit local needs and goals. Research and knowledge hubs have a special role of 1) facilitating and animating smart communities, empowering them with co-creative methodologies and various digital tools, 2) training and providing guidelines for data stewardship to selected individuals within these communities.

In global, and future (long term) scope the data saved in interoperable and accessible repositories foster further data readiness for future use and development in academic research, data-based policy management, multimedia including mobile and XR/AR applications, future AI foundation models training and other emerging uses that might not be evident today.

7. Conclusions

In this report on community-based data approach, the lead of work package Test area network team achieved:

- Concept Exploration:
 - Discusses the concept of open data in rural communities.
 - Identifies barriers to adopting data-based approaches in rural settings.
 - Offers insights on overcoming these barriers through various means, including data ownership, EU Data Spaces, CARE Principles for Indigenous Data Governance, data stewardship, Rural Digital Innovation Hubs (DIHs), Living Labs, and enhancing data ecosystem awareness.
- Good Practices with Open Data:
 - Highlights examples of successful open data implementations in different countries, such as air quality dashboards in Estonia, public budget spending overview in Slovenia, and educational management systems in Brazil.
- Open Data for SmartCommUnity Test Areas:



- Focuses on the representation of community data and provides ideas for displaying data in SmartCommUnity test areas, emphasizing the practical application of open data.
- Guidelines for Community-Based Data Approach:
 - Outlines the definition of a "Community-Based Data Approach" to serve as a foundation for effective data management.
 - Explores the elements of rural data management to support rural development.
 - Describes the role of a Rural Data Steward, including the outcomes of a Rural Data Steward workshop and a diagram illustrating their responsibilities.

In summary, the achieved outcome is the establishment of a general guidelines for a "Community-Based Data Approach," which includes conceptual exploration, best practices, and practical applications. This approach aims to empower rural communities with data-driven solutions, facilitated by the role of a Rural Data Steward in managing and utilizing data effectively.

