

DiGreen Handbook of DIGITAL good Practice

Solutions for cities and municipalities

F. Cecon, P. Decarli, G. C. Dumitrescu, S. Ručinská

eurac
research



DiGreen Handbook of DIGITAL good Practice

Solutions for cities and
municipalities

F. Cecon, P. Decarli, G. C. Dumitrescu, S. Ručinská

Recommended Citation:

Cecon F., Decarli P., Dumitrescu G.C. & Ručinská S., 2023.
DiGreen Handbook of DIGITAL good Practice.
Solutions for cities and municipalities.
Bolzano, Italy: Eurac Research, 2023

Eurac Research

Institute for Public Management
Viale Druso 1
39100 Bolzano, Italy
T +39 0471 055 400
public.management@eurac.edu
www.eurac.edu

ISBN 978-88-98857-86-9 (Digital version)

ISBN 978-88-98857-88-3 (Print version)

Editors: Franziska Cecon¹, Peter Decarli², George Cornel Dumitrescu³, Silvia Ručinská⁴

Authors: Alina Cerasela Avram³, Josef Bernhart², Franziska Cecon¹, Peter Decarli²,
Andreea Emanuela Drăgoi³, George Cornel Dumitrescu³, Miroslav Fečko⁴, Mihaela Gramaticu³,
Melanie Gross², Davide Maffei², Dana Bianca Mitrică³, Simona Moagăr Poladian³, Tina Ortner¹,
Kurt Promberger², Dominik Prüller¹, Steliana Rodino³, Silvia Ručinská⁴

Scientific revision: Prof. Dr. Oliver Sievering⁵, Tamás Szádeczky⁶

¹ University of Applied Sciences Upper Austria, Department of Healthcare-,
Social- and Public Management, Garnisonstraße 21, 4020 Linz, Austria

² Eurac Research, Institute for Public Management, Viale Druso 1, 39100 Bolzano, Italy

³ Institute for World Economy (IWE), Calea 13 Septembrie 13, Sector 5, 050711 București, România

⁴ Pavol Jozef Šafárik University in Košice, Faculty of Public Administration,
Popradská 66, 041 32 Košice, Slovak Republic

⁵ University of Applied Sciences for Public Administration and Finance Ludwigsburg,
Reuteallee 36, 71634 Ludwigsburg, Germany

⁶ National University of Public Service, Faculty of Public Governance and International Studies,
Department of Cybersecurity, 1083 Budapest, Ludovika tér 2., Hungary

Graphics: Eurac Research

Illustrations: Oscar Diodoro

Pre-press: Pluristamp, Brixen (BZ)

© Eurac Research, 2023



This publication is under the terms of the Creative Commons Attribution 4.0

International License (<http://creativecommons.org/licenses/by/4.0/>), which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.



Co-funded by
the European Union

The project Digital Government for Green Municipalities and Cities (No. 2021-1-SK01-KA220-HED-000023505) is Co-funded by the Erasmus+ Programme of the European Union.

Any communication or publication that relates to the project Digital Government for Green Municipalities and Cities (No. 2021-1-SK01-KA220-HED-000023505) reflects only the author's view and the European Commission is not responsible for any use that may be made of the information it contains.

Contents

1. About this handbook	8
2. Why is the digital issue important?	13
2.1. Agenda in the EU	17
2.2. Comparison of the countries in digitalisation	19
2.3. Agenda in Austria	24
2.4. Agenda in Italy	30
2.5. Agenda in Romania	33
2.6. Agenda in Slovakia	40
3. Methodology	47
3.1. Desk research & identification of partner municipalities	48
3.2. Preliminary interviews	49
3.3. In-depth interviews	50

4.	Good practices	52
4.1.	IoT waste management in the City of Kežmarok	55
4.2.	Smart heating for the entire village in Luson	60
4.3.	Tracking the municipality's energy consumption with the Energy Report Online in Lana	64
4.4.	Mapping the city: Kežmarok's GEO Information System	68
4.5.	Digital line management of the Municipality of Naturno	73
4.6.	Adopt a Sidewalk in the City of Košice	77
4.7.	Project Alexa – a voice input and output system for the citizens of Kremsmünster	83
4.8.	A town hall closer to people at a click away, bucharest, romania	88
4.9.	Kremsmünster's electronic official board	93
4.10.	Gura Humorului: implementing a video monitoring system to increase safety and prevent crime	99
4.11.	City Police MSP SOS security app in the City of Kežmarok	104
4.12.	A platform for administrative simplification and better services in Bacău	108
4.13.	Process management in Linz	112
4.14.	Modern administrative mechanisms and procedures in Giurgiu City Hall (MEPAM)	120
5.	Conclusion	125

List of figures	128
List of tables	128
Bibliography	130
About the authors	134

1.

About this
handbook

1. About this handbook

The **DiGreen Handbook of DIGITAL good Practice** is the result of the project *Digital Government for Green Municipalities and Cities - DiGreen*. The project is co-funded by the Erasmus+ Programme of the European Union.¹

The handbook of DIGITAL good practice presents good examples of providing public services using digital means and ICT tools. Municipalities and cities either produce these tools “in-house” or use private sector products.

The text of the handbook is written in a clear, non-technical language, accessible to the general public, in order to be user-friendly and easy to understand and apply for practitioners. The digitally provided public services present ways to rationalise the provision of competencies that the municipalities and cities have, to engage inhabitants in governance, to enhance the provision of public services qualitatively, to base public policymaking on evidence and to take transparency and openness into consideration when providing public services.

The importance of targeting municipalities and cities is relevant in terms of their involvement in higher education. Higher education students of public administration, public management, public policy and other similar study programmes also fulfil their practical part of the study at the municipality and city public bodies.

The handbook was produced in hard copy and electronic format, both in English. The online form is available through the official DiGreen project website.

Short versions of the handbook were published online in the national languages of every partner (Slovak, Italian, German, Romanian).

The authors would like to thank all the involved municipalities and cities whose contribution and cooperation in formulating digital good practice examples were valuable.

¹ Any communication or publication that relates to the project Digital Government for Green Municipalities and Cities (No. 2021-1-SK01-KA220-HED-000023505) reflects only the author's view, and the European Commission is not responsible for any use that may be made of the information it contains.

Municipalities and cities from which good practice examples are presented in this handbook:

- Kremsmünster (Austria)
- Linz (Austria)
- Lana (Italy)
- Naturno (Italy)
- Luson (Italy)
- Bucharest (Romania)
- Gura Humorului (Romania)
- Bacău (Romania)
- Giurgiu (Romania)
- Kežmarok (Slovakia)
- Košice (Slovakia).



PROJECT DETAILS

Programme: Erasmus+

Action Type: KA220-HED - Cooperation partnerships in higher education

Call: 2021

Round: Round 1

Field: Higher Education

Project Title: Digital government for green municipalities and cities

Project Acronym: DiGreen

Project number: 2021-1-SK01-KA220-HED-000023505

Duration: 01. 11. 2021 – 01. 11. 2024

Total Budget: 324 810 Euro

National Agency: Slovenská akademická asociácia pre medzinárodnú spoluprácu (Slovak Academic Association for International Cooperation)

Project Coordinator

Univerzita Pavla Jozefa Šafárika v Košiciach, Fakulta verejnej správy (Pavol Jozef Šafárik University in Košice, Faculty of Public Administration, Slovakia)

Project partner organisations

Accademia Europea di Bolzano (Eurac Research, Italy)

Institutul de Economie Mondiala (The Institute for World Economy, Romania)

FH OO Studienbetriebs gmbh (University of Applied Sciences Upper Austria, Austria)

Project Scope

DiGreen aims to provide professionals working in the municipality/city self-government public bodies and young citizens (students) with a framework to exchange knowledge and digital and green good practices. DiGreen will provide a crosscutting teaching and education DiGreen concept together with a multidimensional curriculum.

DiGreen will facilitate the exchange among an international network of municipalities and cities, municipalities' employees, universities, research institutions and communal practitioners on learning about green digital skills and other environmental and digital issues.

The general objective of the DiGreen project is to establish a transnational collaboration between partners involved and apply innovative approaches for addressing their target groups.

Project results

Project result 1.: Handbook of DIGITAL good practice – cities and municipalities as the source for viable solutions

- The “digital” handbook is a source of good practice in providing digital services at the municipality/city level. Partner municipalities and cities cooperating with the consortium are the primary sources of good examples,
- Project result activities 01.12.2021 – 28.02.2023.

Project result 2.: Handbook of GREEN good practice – cities and municipalities as the source for viable solutions.

- The “green” handbook is a source of good practice for municipalities and cities’ employees as key drivers for a green and sustainable environment. Partner municipalities and cities cooperating with the consortium are the primary sources of good examples,
- Project result activities 01.01.2022 – 31.03.2023.

Project result 3.: Crosscutting teaching and education DiGreen concept

- The teaching and education concept is an interdisciplinary educational and life-long learning knowledge base that encompasses content for developing knowledge in the field of digitalisation and climate neutrality,
- Project result activities 01.02.2023 – 30.06.2024.

Project result 4.: Multidimensional DiGreen Curriculum

- The curriculum is usable in its entirety or at the level of particular specific modules for higher education covering digitalisation and climate neutrality topics,
- Project result activities 01.08.2023 – 31.08.2024.

<https://www.upjs.sk/fakulta-verejnej-spravy/en/international-relations/digreen/>



2.

**Why is the digital
issue important?**

2. Why is the digital issue important?

“As Europeans, we want to be the global leader of a digital transformation that puts people at its heart” (von der Leyen, 2021). This excerpt from Commission’s President Ursula von der Leyen’s speech during her address to the 2021 Digital Assembly in Portugal underlines the importance and the priority role that digitalisation covers for the European Union and its Member States in the short and medium term. At the same time, they also highlight the importance of people within such transformative processes.

The public sector is highly relevant in enabling and facilitating the digitalisation of society and the economy. Still, it is also challenged by its digital transition. “Few developments have had broader consequences for the public sector than the introduction of the Internet and digital technology” (West, 2011, para. 1). Digitalisation is no longer an option for the public sector; this was already clear before the recent developments related to Covid-19 further stressed the necessity of such transformation. “New technology is altering governmental performance, the political process, and democracy itself by improving government responsiveness and increasing information available to citizens” (West, 2011, para. 1).

The public sector has a prominent role in providing services to businesses, individuals and households as well as across the public administrations composing it. The part of the information produced by the public sector is highly relevant. Back in 2004, Aichholzer and Burkert argued that the public sector is “the biggest single producer and holder of information including administrative and government documents, regulatory texts, political data and public registers” and the number of stakeholders for whom public sector information represents a “key resource” is remarkable (Aichholzer & Burkert, 2004, para. 2).

The public sector needs modernization to keep up with the times and to realize benefits for both the administrations and the businesses. Moreover, modernization is “necessary in order to ensure future wellness for the citizens” (Vaidya & Campbell, 2016, p. 337).

A better, more digitalised public administration can offer better services and consume fewer taxpayers’ resources. This is particularly relevant now, where economic relief necessitates full support from the public sector, which cannot be provided with a slow bureaucracy that massively relies on paperwork.

Like in any organization, also in the public sector, it is not just about implementing “the right policy models” but even more about paying attention to the “relationship between these models and the practices and events that they are expected to generate or legitimize” (Mosse, 2017, p. 639). The success of digitalisation projects is highly dependent on the governance structures adopted and from outstanding portfolio management, capable of coordinating different digitalisation initiatives across many organizational levels “with the national digitalization strategy” (Lappi et al., 2019, p. 159) and with the EU digital agenda.

The coordination efforts across the many organizational levels are of paramount importance. These are necessary to create a sound and smooth digital backbone of public services enabling interoperability at many levels and reducing the complexity of the digital transition. Through coordination, synergies can be achieved. Best practices can be exchanged, and administrations can learn from others' mistakes, avoiding costly failures.

Coordination shall take place both horizontally and vertically: horizontally across similar pair administrations like across municipalities and vertically between higher ordered administrations like European and national ones and those closer to citizens like municipalities.

Municipalities do have a unique role in pursuing a successful digital transition. Due to their large number as well as similar competencies and challenges, digital solutions apply to many municipalities, maximizing the potential for synergies. At the same time, municipalities are the closest administration to citizens. They are, therefore, crucial in bridging the digitalisation of the public sector to the general public.

In addition, digital change and the transcendence of national boundaries urge “supranationally coordinated policy initiatives in addition to national measures” to support fiscal and regulatory policies (Schratzstaller, 2018, p. 11).

This handbook of digital good practices aims to enhance and favour synergies across municipalities by gathering best practices in providing public services using digital means and ICT tools. The solutions are in-house services and successful examples of collaborations with private actors. Moreover, the handbook stresses the relevance of a European perspective in the digitalisation process. It analyses examples from municipalities across different European Countries and brings them together to provide valuable support and a source of inspiration for other local institutions willing to implement innovative digital projects. The best practices provided also describe the path that led to success, which often proved challenging and where mistakes were made. This further strengthens the value of this handbook, which is not just a source of inspiring suggestions, but also yields the very concrete potential of achieving time and cost savings in the implementation of digital projects, greater citizens' participation and involvement, as well as greater efficiency and efficacy in the delivery of public services. The digitally provided public services will present ways how to rationalize the provision of competencies that the municipalities and cities have, how to engage inhabitants in governance, how to enhance the provision of public services qualitatively, how to base public policymaking on evidence and even how to take transparency and openness into consideration when providing public services.

DIGITALISATION AND E-GOVERNMENT

Public sector digitalisation should be separate from e-government, even though they are closely intertwined and mutually influential. The current literature also seems to struggle to keep the two terms apart. This handbook draws in particular on the distinctions made by Schmid (2019), according to which there are three main elements in which the two trends differ from each other.

- The technical requirements are so different that e-government could be considered a digitalisation prerequisite. The latter is linked to much more recent developments in information and communication technology (ICT). In contrast, e-government emerged at the end of the last century to enable public administration to adopt a new management model. Such a model required technical and instrumental support, forcing the public sector to renew its ICT inventory. The ICT structure developed as a result is the foundation that has allowed digitalisation to take root and strengthen its role. Still, it is not one of its objectives. Digitalisation is less about the technical infrastructure and more about the reduction of (manual) jobs and the automation and acceleration of processes in public administration (Schmid, 2019).
- E-government has an inherent focus on the public sector, which limits it exclusively to the state and administrative domain. In contrast, digitalisation initiatives are less dependent on an organisation's business model. According to this aspect, digitalisation represents an aspect of e-government that facilitates the achievement of its objectives through automated and digitised processes (Schmid, 2019).
- The task focus on digitalisation aims to replace the need for human intervention in the performance of tasks. Digitisation seeks to determine the workflows of administrative tasks in order to automate them, an approach that was not even considered when e-government was first introduced. Consistent changes in both organisational structure and procedures are unavoidable, as digitalisation directly affects task performers, who are involved at both structural and procedural levels (Schmid, 2019).

In the public sector, e-government is a broader concept than digitisation, encompassing “[...] all government roles and activities, shaped by information and communications technologies” that affect “the state's economic and social programs; its relationships with the citizen and the rule of law (e-democracy), its internal operations and its relationship with the international environment” and aims to make public administration more citizen-centred, transparent, competitive and accountable (Brown, 2005, p. 241). E-government uses ICT not only to deliver services and improve administrative efficiency while promoting democratic values but also seeks to create a regulatory framework capable of supporting information-intensive initiatives and fostering society's knowledge (Gil-Garcia & Luna-Reyes, 2006).

Digitalisation is a key enabler of e-government, but it is more process- and task-oriented. It also goes beyond public sector boundaries. Despite this, digitalisation in the public sector can only be considered partially equivalent to private solutions, as digitalisation is implemented with a clear profit maximisation objective. In contrast, public sector initiatives aim to maximise the common good (Schmid, 2019). The goal of any public administration is not

to make a profit, which indicates an inability to use available resources, but to use them in the most efficient and effective way to provide the maximum contribution to society.

With this distinction in mind, digitalisation can be generally defined as the integration of multiple technologies into all aspects of daily life that can be digitised” (Gray & Rumpe, 2015, p. 1319). It should be understood as a process in which those activities that rely on analogue information, which can be encoded “into zeroes and ones so that computers can store, process, and transmit” (Bloomberg, 2018, p. 2) are automated and thus performed by computers instead of humans (Hess, 2019). The focus should be on automation in particular, as digitalisation is much more than digitisation (encoding into zeros and ones). Digitalisation can also involve the radical introduction of disruptive business and organisational models (Heuermann, 2018). A pure technology orientation needs to sufficiently consider the public sector’s specific governance. Digitalisation should not simply replace such governance, as there are good reasons why public administration is organised the way it is. Failure to recognise the special and unique characteristics of the public sector is likely to prevent digitalisation efforts from being successful (Schmid, 2019). Digitalisation is a substantial organisational change which requires a change in the culture of public administration. At the moment, this still requires much work. However, afterwards, digitalisation will allow for a massive reduction in bureaucracy as well as a consistent reduction in the administrative costs that taxpayers currently have to bear (Färber, 2021).

Digitisation should be understood as a journey rather than a simple project, involving Big Data and data correlation, the transformation of business models and the use of artificial intelligence, the automation of decisions and the use of the Internet of Things, as well as a set of new demands and new competencies for public administration staff (Gasslitter & Fischer, 2019).

2.1. AGENDA IN THE EU

Green and digital are the two pillars characterising Europe’s actions. The post-pandemic recovery in Europe will be constructed upon these two aspects as the primary condition for the *Recovery and Resilience Facility (RRF)* has proved. Every EU country willing to have access to the *NextGenerationEU* grants and low-cost credits had to prepare an ambitious investment plan where at least 37% of total funding would have been spent for green purposes and a further 20% for digital ones. Now that almost all national recovery plans have been approved (only the Hungarian one is missing), data show that Member States have even gone further and dedicated, on average, 39.9% of total funding to green projects and 26.4% to digital ones (European Commission, n.d. a). Considering that the *Recovery and Resilience Facility* exceeds 800 billion Euro, around 320 billion Euro will be spent on green initiatives and more than 211 billion Euro on the digital transition of the economy, the society, and the public administration.

In order to further stress the priority that digital aspects have for the near future, the European Commission has presented a new program to enhance the digital transition complementarily to the already existing European programs. The so-called *Digital Europe Program* represents a new instrument with funding of 7,5 billion Euro to support the digitalisation of citizens, businesses and public administrations. The program will provide funding in five relevant areas: high-performance computing, artificial intelligence, cybersecurity, advanced digital skills and deployment and wide use of digital technologies (European Commission, n.d. b).

Despite the European Treaties not containing special instructions about information and communication technologies, the EU still represents a central actor with a central role in realising the digital transition and has enough power to intervene in it through sectoral and horizontal policies directly. There are numerous fields where the EU can robustly act: from industrial and competition policies to trade policies and Trans-European Networks, from research and technological development and space to energy policy and the approximation of laws for improving the internal market's establishment and functioning. In addition, the EU can act upon the free movement of goods, people, capital and services on education, youth and sport, and culture (European Parliament, 2022).

The milestones of the EU's path towards a digital future count the digital agenda for Europe signed in 2010 for 2010-2020 as the first relevant step. The document acknowledged for the first time the role played by ICTs in achieving Europe's goals. Later on, in 2015, the digital single market strategy further developed the digital agenda. The strategy primarily tackled aspects related to access to and the conditions for digital solutions while maximising the potential of the digital economy. In 2020, a new ten-year digital agenda was set, focusing on technology that works for people, a fair and competitive economy, and an open, democratic, and sustainable society. Just one year later, in 2021, the agenda was complemented by the 10-year *Digital Compass*, which aims at making the EU's digital ambitions more concrete. The *Digital Compass* mentions that 80% of the EU population possessed at least basic digital skills within the decade, and 20 million ICT specialists were employed until then. 75% of companies should have opted for cloud solutions, big data and AI, with 90% of SMEs possessing at least basic digital intensity. All EU households should have gigabit connectivity, and 20% of the world semiconductors' production should be located within the EU. Until 2030, all key public services must be available online, with all citizens having access to their e-medical records. Finally, 80% of EU citizens shall use an electronic identity solution (European Parliament, 2022).

Different achievements have already been reached. For instance, the first digital agenda led to reduced prices for electronic communications and the end of roaming charges. It improved internet connectivity, comprehensive basic broadband coverage, and consumer protection. The latter has been further strengthened by the 2016 *General Data Protection Regulation (GDPR)* (European Parliament, 2022).

The new agenda focuses on creating safe and secure digital services and markets. Besides the *Digital Compass*, it is supported by numerous complementary programs endowed with remarkable budgets. The *Digital Europe Programme (DIGITAL)* with a budget of 7.5 billion Euro for 2021-2027 to foster supercomputing, AI, cybersecurity, advanced digital skills and the usage of digital technology across the economy and society. *Horizon Europe*, the

Connecting Europe Facility for digital infrastructure and the *Recovery and Resilience Facility*, like the various Structural Funds, further support Europe's digital strategy. Furthermore, a specific European strategy for data strives to increase data availability, reusability and trust in data sharing. Action within this strategy foresees the creation of a European Data Space, which should involve relevant sectors like, among else, health, public administration, environment and finance. Moreover, other programs and actions are set to strengthen digital security and safety, increase trust and educate citizens on digital technologies (European Parliament, 2022).

Member States' progress in the digital single market realisation is assessed yearly through the DESI index, which also helps them identify the areas where more action is needed (European Parliament, 2022).

2.2. COMPARISON OF THE COUNTRIES IN DIGITALISATION

Digitalisation of society in general and the performance of countries in e-government are important areas in today's day and age. Over the years, several different indicators and rankings have been developed to compare the performance of the countries in the respective topics. Some indicators, for example, the *Digital Economy and Society Index (DESI)*, have a more comprehensive focus, analysing the overall digitalisation of the society in each country. Other indicators, like the European Commission's *eGovernment Benchmark* or the UN's *E-Government Survey*, focus more specifically on the digital transformation in providing government services using ICT.

The performance and score of each country in the **Digital Economy and Society Index (DESI)** are derived from four main dimensions, as listed in Table 1. Every dimension is composed of several sub-dimensions analysed through specific indicators. A country's final score is thus a result of how the particular country performed in all indicators. To achieve progress, the indicators have to be improved simultaneously. That means that the DESI index intends to showcase the digitalisation of society within its different facets.

DIMENSION	SUB-DIMENSION
Human capital	Internet user skills
	Advanced skills and development
Connectivity	Fixed broadband take-up
	Fixed broadband coverage
	Mobile broadband
	Broadband prices
Integration of digital technology	Digital intensity
	Digital technologies for businesses
	e-Commerce
Digital public services	e-Government

Table 1: Digital Economy and Society Index structure
Source: European Commission (2022a)

According to the specific country reports for the DESI index (European Commission, 2022b), Slovakia, Austria, Romania, and Italy, represented in this handbook, perform differently.

DESI 2022 – relative performance by dimension

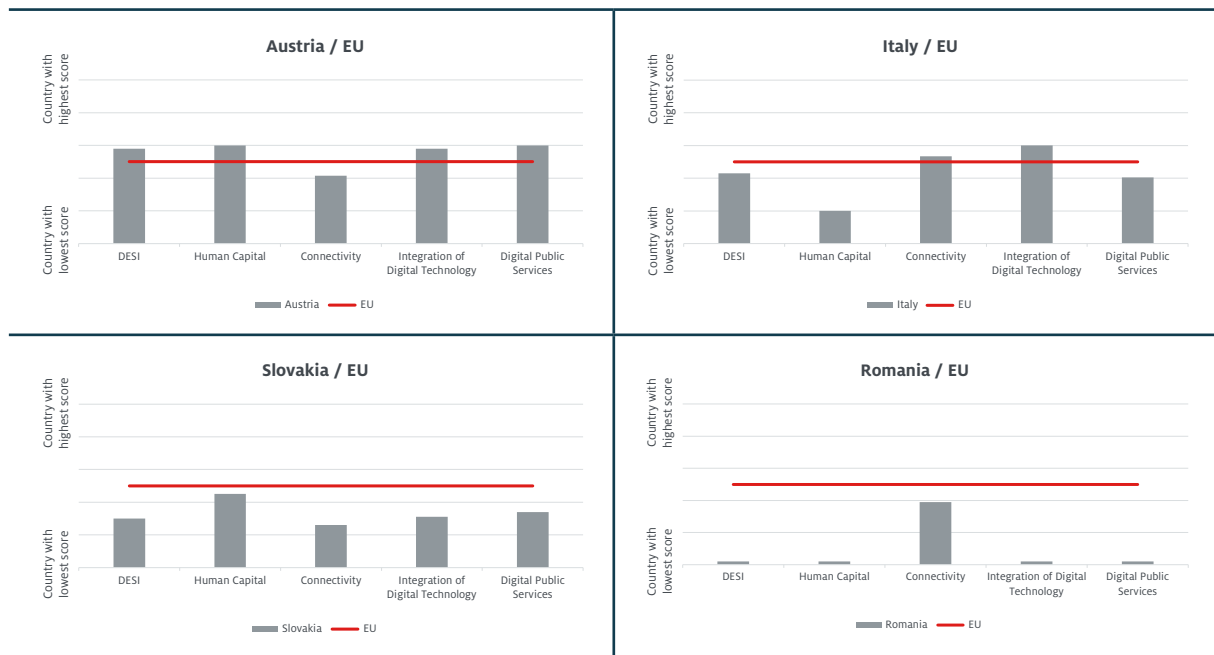


Figure 1: Countries' performance in the DESI index
 Source: European Commission (2022b)

In 2022 Austria, with its total score of 54,7%, ranked 10th out of 27 EU Member States and performed in line with the EU average. Over the last five years, the country progressed similarly to the EU average. Austria's strategy for further developing its digitalisation focuses mainly on values, data, resilience, security, digital skills in public administration, e-health, and the digitalisation of agriculture. Austria also dedicated 52,8% of its *National Recovery and Resilience Plan* to digital objectives.

Italy, with an overall result of 49,3%, is ranked 18th out of 27 EU Member States and falls slightly below the EU average. Between 2017 and 2022, it was the best-performing EU Member State when considering its growth within the index. Further development of Italy's digitalisation focuses on several areas, such as 5G connectivity, broadband coverage, the *Italian Cloud Strategy*, digital population register, e-ID, mobile app to access digital public services, a *National Strategy for Digital Skills* and others. Italy's *National Recovery and Resilience Plan* is the largest in the EU by budget, and 25,1% is dedicated to digital objectives.

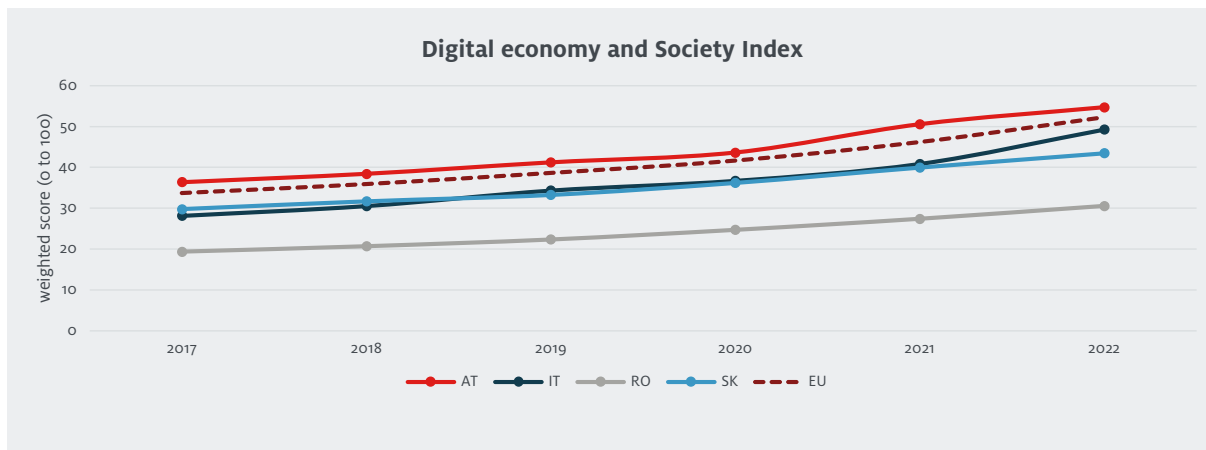


Figure 2: Comparison of Slovakia, Austria, Italy and Romania in the DESI index
 Source: European Commission (2023)

Slovakia ranked 23rd out of the 27 EU Member States with an overall score of 43,4%. Over the last five years, Slovakia has steadily improved its performance, but it still falls short of the EU average. Overall, 21% of the Slovak *National Recovery and Resilience Plan* is dedicated to digital objectives, with *Component Digital Slovakia* being the main contributor to the country’s future digital transformation. The main areas of the country’s future digital focus are mobile apps for government services, cybersecurity, fast internet for everyone and digital economy, digital investments in education, research and innovation and sustainable transport.

Romania ranked 27th out of the 27 EU Member States, scoring 30,6% in the index. Romania improved its performance over the last five years, but the progress falls short of the growth rate of other countries. The country’s *National Recovery and Resilience Plan* dedicates 20,5% of the total allocation to digital objectives. It targets several areas related to digital progress, such as digital transformation, sustainable transport, tax and pension reform, business support, research, development and innovation, local fund, good governance, and education.

The **eGovernment Benchmark** is the European Commission’s evaluation of e-government across 35 countries in Europe. The benchmark focuses specifically on the provision of digital public services. The methodology is based on four main pillars, which are divided into 14 indicators:

- User Centricity (online availability, mobile friendliness, user support)
- Transparency (service delivery, personal data, service design)

— Key Enablers (eID, eDocuments, authentic sources, digital post)

Cross-Border Services (online availability, user support, eID, eDocuments).

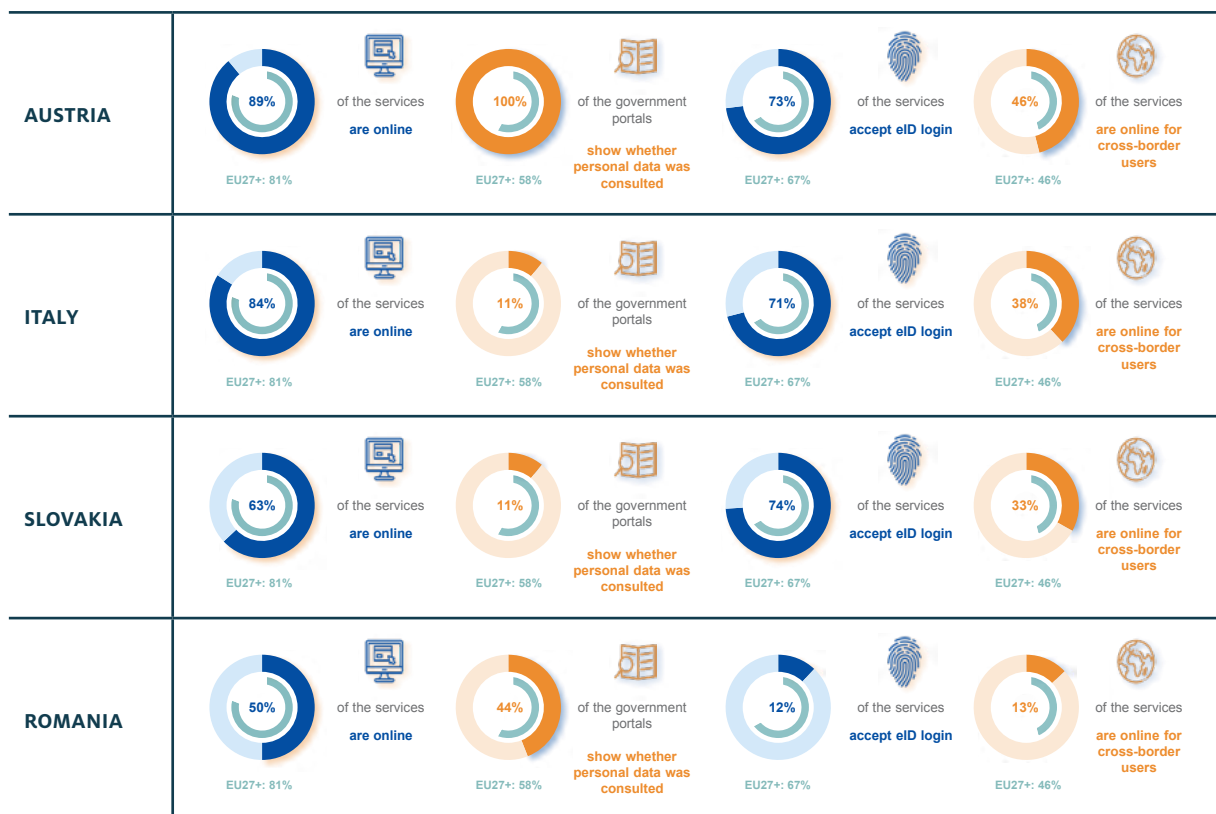


Figure 3: Key figures of the eGovernment Benchmark in Austria, Italy, Slovakia and Austria
 Source: eGovernment Benchmark (2022)

Like DESI, the latest 2022 eGovernment Benchmark report also shows performance differences between Austria, Italy, Slovakia and Romania:

- Austria (score 76%, rank 13)
- Italy (score 61%, rank 24)
- Slovakia (score 60%, rank 26)
- Romania (score 42%, rank 33).

2.3. AGENDA IN AUSTRIA

Digital projects are driven mainly by external circumstances and trends, such as the Covid-19-pandemic. The latter has been a powerful driver of digitalisation in public administrations, especially due to the necessity to work from home. Digitalisation is also fuelled by citizens' demands and expectations, the general trend towards modernization and climate change. Another vital factor is limited resources, which require public administrations to become more efficient by streamlining their services and internal processes. Digitalisation is also pushed forward by new technological opportunities. There are also societal trends, such as changes in family life and the increasing number of women in the workforce. Therefore, more and more families can no longer go to a public office during opening hours and rely on digital solutions to deal with administrative matters. Another important factor is that citizens are becoming more accustomed to the 24/7 availability of digital services and online shopping. This means they increasingly demand the same from public services.

These developments lead to digitalisation both at the national and local levels. While this handbook focuses on the local level, it still might be of help to have a look at the situation at the national level as well in order to understand the context.

2.3.1. Digitalisation at the national level

The Austrian government published a digitalisation strategy in 2016 called *Digital Roadmap Austria*.² It defines 12 key principles of digitalisation in Austria:

- everybody should be able to participate;
- digital education should start as early as possible and should be an integral part of schooling;
- human rights must also be respected in the digital world;
- ensuring everybody's access to the internet is a key priority;
- digitalisation should create new jobs, and necessary training for staff should be facilitated;
- modern laws should define a framework for digitalisation;
- Austria should become an internationally leading country in digitalisation;
- science should be supported in digitalisation;
- Austria wants to be an active part of the European digital market;

² Although the website states that it is an archive, which could be due to the fact that the composition of the Austrian government has changed twice since 2016, the Digital Roadmap could still provide an insight into Austria's digitalisation strategy.

- digital security for citizens, companies and public institutions, as well as data protection, should be ensured;
- discussions should also be conducted respectfully online;
- citizens and businesses should have the right to communicate electronically with public institutions and authorities.

Bundesministerium für Digitalisierung und Wirtschaftsstandort (2016)

The government is working on several digitalisation projects in line with these principles. For example, *SaferInternet* aims to improve citizens' skills in the safe use of digital services. Another example is the *Digital School* strategy, which aims, for example, to provide all students with electronic learning devices (Bundesministerium für Bildung, Wissenschaft und Forschung, 2020).

The Austrian federal government also launched a central e-government platform called *oesterreich.gv.at*. This platform enables citizens to digitally:

- change their principal legal residence;
- request vote-by-mail ballots;
- acquire certificates of residence registration;
- request criminal records;
- report new-born children or cases of death;
- and many other administrative affairs.

Most of these matters are handled by the municipal authorities. Still, they are part of the delegated responsibilities (Bundesministerium für Finanzen, 2022), which means that municipalities have no decision-making power about these subjects. Their task is solely the execution of decisions and directives of superior public bodies. Therefore, they must accept electronic communication if the responsible superior public bodies decide so.

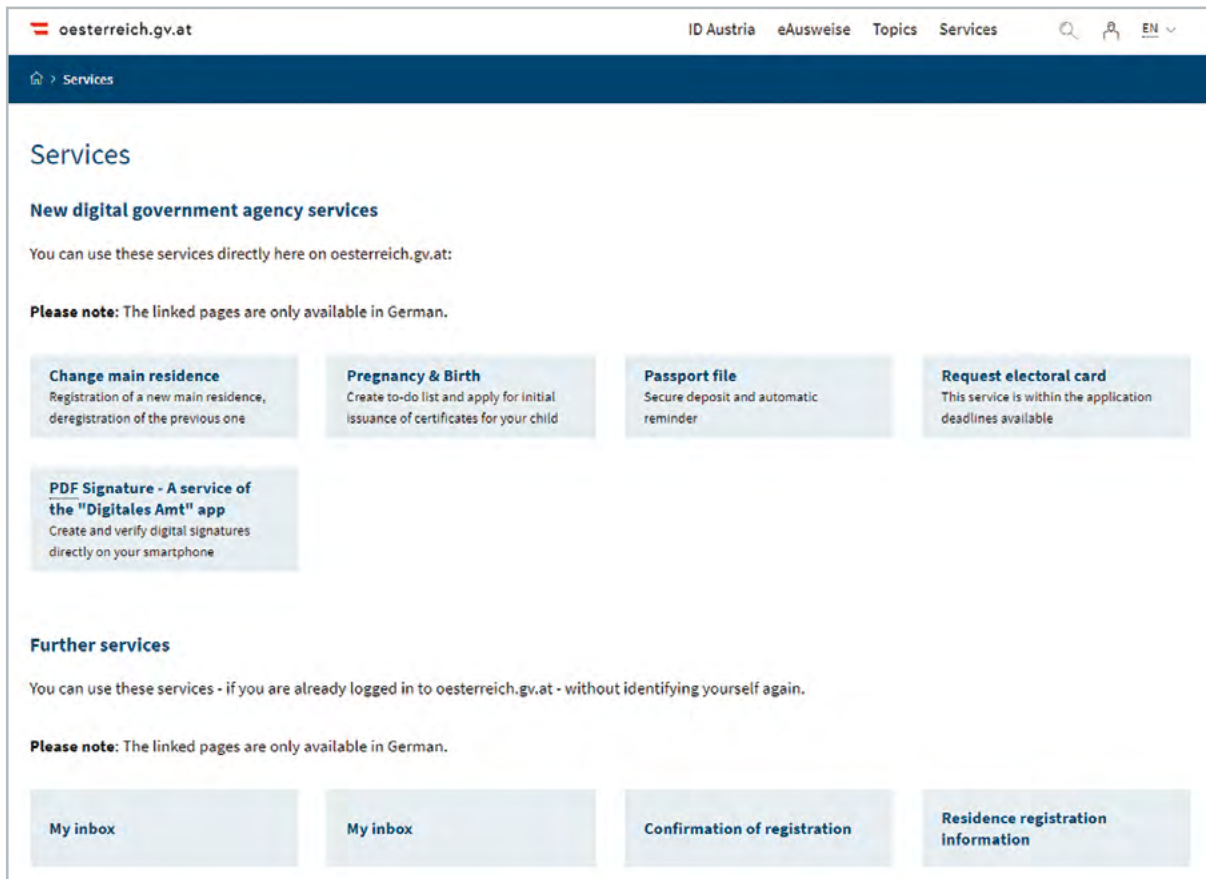


Figure 4: oesterreich.gv.at – Austria’s e-government platform for citizens
Source: Bundesministerium für Finanzen (n.d. a)

Just like for citizens, there is another e-government platform called “*Unternehmensservice-portal*” (USP) or *Business Service Portal*, which offers services for companies. It allows companies and their management to digitally fill in and submit forms regarding taxes, employ-ees, takeovers and dissolutions, and specific issues such as health and safety regulations (Bundesministerium für Finanzen, n.d. b).

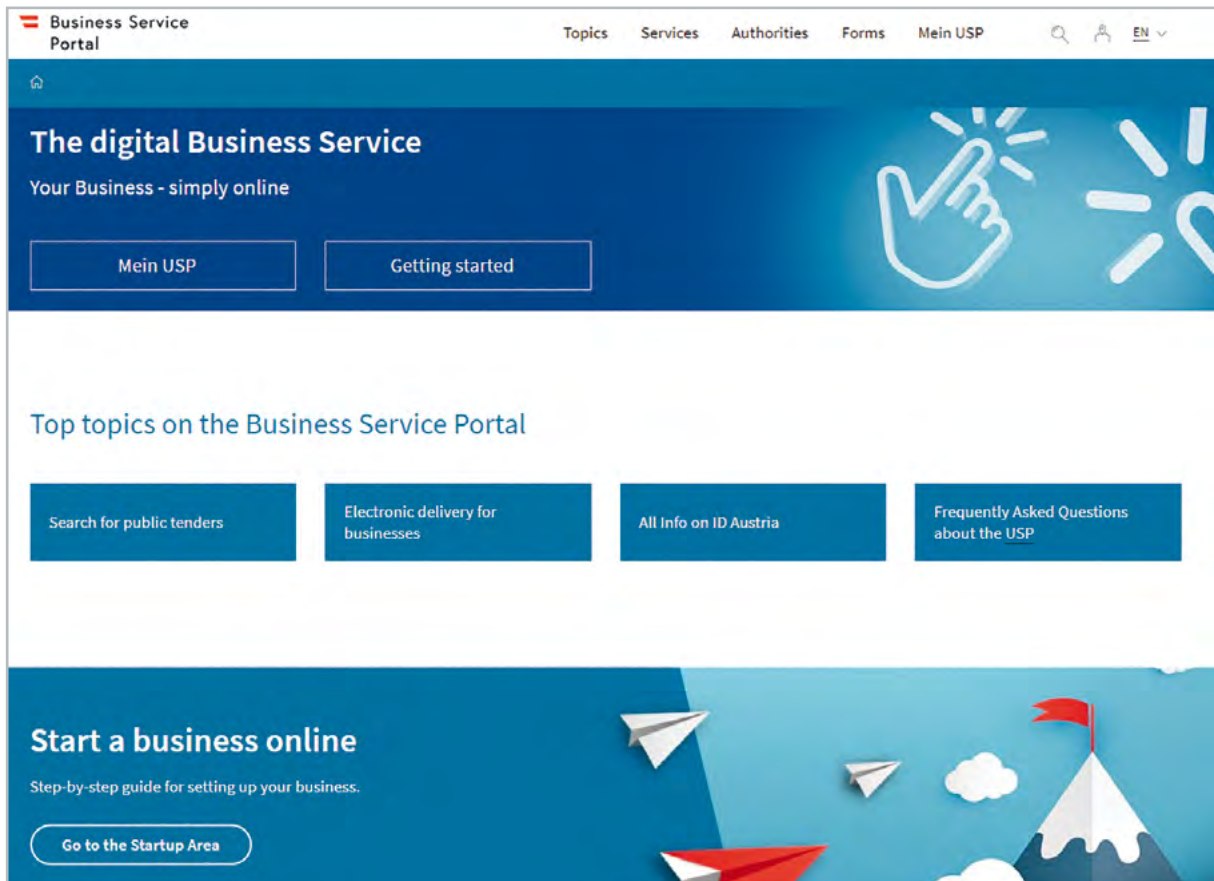


Figure 5: usp.gv.at – Austria’s e-government platform for businesses

Source: Bundesministerium für Finanzen (n.d. b)

Another aspect of digitalisation is *Open Government Data*. The Austrian federal government and the cities of Vienna, Linz, Salzburg and Graz initiated the Open Data portal *data.gv.at*. It invites public authorities to publish data in a standardized and accessible format and make it available to the general public. As of November 2022, more than 41,000 datasets have been uploaded by 2,390 different organizations. These datasets have been used by more than 700 applications (Bundesministerium für Finanzen, n.d. c.).

Some federal laws are specifically relevant to digital projects. For instance, the *Austrian E-Government Act* facilitates and defines electronic communication between citizens and public authorities and grants citizens the right to electronic communication. Still, this right only applies to federal matters, not local administrations. Another law also regulates the validity and use of electronic signatures. The eIDAS (*electronic IDentification, Authentication and trust Services*) EU regulation (910/2014) applies to electronic signatures. The aforementioned Austrian law (Signatur- und Vertrauensdienstegesetz – SVG) is based on this EU regulation. The validity of electronic signatures is of great importance for digitalisation as it eliminates the need to sign documents by hand. It is also essential to allow users to authenticate themselves when using online services, i.e. to prove that they are who they say they are. It is also beneficial for cross-border communication, as these signatures are valid throughout the EU.

The “*Zustellgesetz*” (delivery law) is crucial for communication between citizens and the state. This law defines in detail how and under what circumstances documents must be delivered to recipients. An entire section of this law deals exclusively with electronic communication, ensuring that all the standards for analogue communication are also used for digital communication (*Zustellgesetz – ZustG*). The Act describes two types of electronic delivery: delivery with proof of receipt (§ 36) and delivery without proof of receipt (§ 37). In both cases, the documents must be deleted 10 weeks after delivery, whether or not they have been read (§ 36(4), § 37(3)).

2.3.2. Digitalisation at the local level

The digital agenda at the local level in Austria is determined by the municipalities themselves in their area of independent responsibility, but also by federal and state laws. The duties of an Austrian municipality are divided into two categories: delegated responsibilities and independent responsibilities.

Municipalities make their own decisions on matters that fall within their own sphere of competence without any directive from higher regional or national authorities. These are defined as matters that fall exclusively or predominantly within the sphere of interest of the municipalities (Article 118 B-VG). Some examples of independent responsibilities of Austrian municipalities are business operations, the collection of local taxes, the municipal budget and the appointment of local administrative staff, municipal roads, and building and fire authorities. In these areas, the municipalities' political entities decide independently (Articles 116 and 118 B-VG). This means municipalities are free to initiate their own digital projects for all matters within their independent competence. However, there may still be federal laws and regulations they must consider, e.g. regarding data protection.

In contrast, municipalities don't have any decision-making powers whatsoever about issues within the field of delegated responsibilities, as they only execute the regulations of higher authorities (Article 119 B-VG). Carrying out federal elections, the census and registry offices are examples of delegated responsibilities (Bundesministerium für Finanzen, 2022).

Most of the projects are initiated either by politicians in key positions (e.g. mayors) or by the local administration staff. Sometimes digitalisation is a joint effort of the entire local government. However, in most cases, it is pushed forward by just a few actors inside the municipality's administration or even just one highly committed person. Some ideas are also generated through cooperation with external partners such as universities or other institutions. Only a minimal number of projects are initiated by citizens. The actual processes and arrangements behind initiation, decision-making and implementation vary significantly between municipalities and also depend a lot on the size of the municipality.

Decision-makers have different motivations for initiating digitalisation projects. For example, local administration staff sometimes seek to make their work easier or less repetitive by streamlining and automating administrative procedures. For them, increased work quality can be a strong incentive that goes along with digitalisation. At the same time, some employees are concerned that their work will become more complicated or that jobs will be lost. On the other hand, politicians especially try to raise their citizens' satisfaction

by offering digital services that meet their demands. Some politicians initiate digitisation projects because they believe in the idea, without considering public opinion at this stage.

It should be noted that many internal digitisation projects have little direct impact on citizens' lives or on their interaction with public administrations. This is why these projects are often not actively communicated to the public. However, these projects can help to increase citizen satisfaction by improving internal procedures leading to higher-quality services and quicker responses.

Large cities such as Vienna and Linz have also established specialized companies or departments owned by the municipalities and responsible for the city's communication and information technology. They tend to play an important role in digitalisation projects by developing and providing the necessary infrastructure. In contrast, smaller municipalities don't have such institutions. They must rely on private companies that offer the services needed to implement digital projects and have the know-how to deal with data protection issues.

The City of Linz has developed a digitalisation strategy called "*Digitales Linz*" (digital Linz). It was initiated by the mayor of Linz and was published in 2021. Its purpose is to define strategic goals regarding digitalisation and to generally promote and support digitalisation in Linz. Eight priorities, which offer particular challenges and chances in the field of digitalisation, have been selected (Magistrat Linz, 2021):

- Art and culture
- Industry
- Startups and innovative communities
- Digital services of general interest
- Digital education and research
- A new world of work
- Local economy
- Digital local administration.

2.3.3. Digitalisation and the role of unions

Unions include all types of associations, such as clubs, labour unions, foundations, trade associations, alliances or any other form of NGO. They are usually initiated by citizens or other actors to promote their own interests or to advocate for a particular cause. Unions represent citizens' and other stakeholders' interests and expectations and are therefore crucial for political decision-makers and local administrations to understand social trends. Nevertheless, according to the interviews carried out during this project, they usually don't play an essential role in initiating digitalisation projects. Their opinions and feedback are

mainly used to adapt projects to citizens' demands and to improve digital solutions, but this happens after the actual initiation of a project. Therefore, the role of unions seems to be important before the initiation, as they convey social trends and urge politicians and the local administration to "do something". After the initiation, they are a source of valuable feedback and can help the municipality to understand citizens' needs. Politicians or the local administration usually take the actual initiation of projects, i.e. the idea behind the project and the decision to implement it.

Examples of unions that play a role in digitalisation in municipalities are public service labour unions, such as:

- *YOUNION* (Trade union of municipal employees)
- "*Städtebund*" (League of Towns)
- "*Gemeindebund*" (Association of Austrian Cities and Towns)
- "*Fachverband der leitenden Gemeindebediensteten Österreichs*" (*FLGÖ*, an association of high-level local administration staff)
- "*Bund, Länder, Städte und Gemeinden*" (*BLSG*, a cooperation between the Austrian federation, the Austrian states and cities and towns).

Apart from that, also universities can have some influence on digitalisation projects. All these unions' roles are mainly to share know-how, feedback and other information and to promote internal communication and decision-making. In addition, unions may be concerned about changes brought about by digitalisation that affect workers' rights, for example, working from home. Some unions, such as the Austrian Association of Cities and Towns, also influence digitalisation by setting common standards.

2.4. **AGENDA IN ITALY**

Italy's digital agenda is labelled "*Italia digitale 2026*", an ambitious strategy to bring Italy among the top European Countries for digitalisation by 2026. The strategy has been developed along two main axes: digitalising public administration and constructing ultrafast internet networks. Both axes have a similar budget of more than 6,7 billion Euro each (6,74 and 6,71 billion Euro respectively) (Dipartimento per la trasformazione digitale, n.d.). The Italian digital strategy is tightly connected to the *National Recovery and Resilience Plan*, which has been approved by the European Commission and the Council. 27% of the Italian *Recovery and Resilience Plan* is dedicated to digital objectives (Dipartimento per la trasformazione digitale, n.d.).

The first axis of the Italian digital strategy regards public administration. It must become an "ally" of citizens and businesses by offering highly efficient and easy-to-use services (Dipartimento per la trasformazione digitale, 2023). In order to achieve these ambitious goals,

there is a lot of work to do. First, digital infrastructure has to be built. This means that public administrations must be pushed towards cloud migration, boosting interoperability and implementing the so-called “once-only” principle on the way to do so. All this must be further accompanied by initiatives augmenting the digital skills of public employees, citizens and businesses (Dipartimento per la trasformazione digitale, 2023).

In particular, the 6,74 billion Euro assigned to the first axis of the Italian digital agenda is divided as follows: 900 million Euro for the digital infrastructure, 1 billion Euro for cloud migration, 650 million Euro for data management and interoperability, 2,01 billion Euro for digital services and digital citizenship, 620 million Euro for cybersecurity, 610 million Euro for the digitalisation of the central administrations and further 200 million Euro for basic digital competences for citizens (Dipartimento per la trasformazione digitale, 2023).

The second axis of the Italian digital agenda is focused on ultra-broadband connections, which are supposed to cover the entire national territory until 2026. This axis is subdivided into five smaller plans. The first plan, *Italy at 1Gbps*, is a 3,8-billion-Euro heavy strategy to guarantee all interested households connectivity with a download speed of 1 Gbps. The *Italy 5G* plan, with its 2,02-billion-Euro endowment, is also very generous and wants to incentivize the construction of 5G mobile networks. The third plan allocates 261 million Euro for “connected schools”; 501 million Euro are foreseen for plan 4, “connected healthcare”, and the remaining amounts will be used for plan 5, “minor islands” (Dipartimento per la trasformazione digitale, 2022).

The 2026 digital strategy and the *National Recovery and Resilience Plan* have formulated five quantitative objectives. First, at least 70% of the population should possess and use the digital identity SPID (Sistema Pubblico di Identità Digitale – Public Digital Identity System). One of the ten certified identity providers can issue the digital identity, which comes with three different security levels. Currently, more than 32 million Italians already have a digital identity. The second objective concerns the digital skills of the population, which should be increased so that by 2026 70% of the population has achieved digital literacy. The third point involves the public administrations and their cloud migration. By 2026, at least 75% of all public administrations should be using cloud solutions. Furthermore, at least 80% of essential public services shall be delivered online, and 100% of households and businesses are expected to have access to ultra-broadband network services by 2026 (Dipartimento per la trasformazione digitale, n.d.).

The Italian digital strategy is further accompanied by a three-year plan that deals mainly with the digitalisation of public administration. The so-called “Three-year Informatics Plan” is updated yearly and foresees measures for the following three years. Currently, the 2021-2023 plan is being implemented. After the updates brought in 2022, it contains a sort of to-do list of about 200 actions. The responsibility for the implementation is given mainly to AgID (Agenzia per l’Italia Digitale / Agency for Digital Italy), the Department of Digital Transformation as well as other institutional subjects and central and local public administration.

This three-year plan has the purpose of fostering a digital society. Digital services are expected to put the person or the enterprise first and the public administration to become a developmental driving force for the country. The development pursued must be a sustain-

able, ethic and inclusive one. Finally, the plan shall incentivize innovation, experimentation and standardization within the public sector (AGID, 2023). The plan is built according to eight guiding principles: (1) digital and mobile-first for services that must be accessible using the digital identity. When developing new service solutions, public administrations shall adopt a (2) cloud-first approach while being aware of possible lock-in risks. Services shall be (3) inclusive and accessible to best respond to the necessity of both people and territories. They must be interoperable by design, meaning they shall work without interruption within the entire single market. (4) Security and privacy by design represent the fourth point of the plan. Services must be designed and delivered securely and guarantee personal data protection. New digital services are also expected to be (5) user-centric, data-driven and agile. They shall foresee agile possibilities for continuous improvement relying on users' experiences and the continuous measurement of service usage and performance. This point also reminds us that services should be cross-border by design. The sixth point is short but leaves little space for misinterpretation: (6) once-only. Public administration must stop asking citizens and companies about already provided information. Italy also stays committed to considering (7) public data as a common good that must be valorized. As such, they must be made accessible to citizens and companies in an open and interoperable way. The last point is (8) open code. Public administration should opt for open-coded software or make the source code available if the software solution has been developed in-house (AGID, 2023).

2.4.1. Digital agenda at the local level

Within Italy, the Regions and the Autonomous Provinces further develop plans to sustain digitalisation within their territories in accordance with the national and European goals and strategies. Considering that the Italian municipalities analysed within this study are located in the Autonomous Province of Bolzano - South Tyrol, this province's digital agenda will also be briefly described.

The current digital strategy pursued in South Tyrol covers 2022 to 2026. Among the objectives of the strategic paper, there is the clear intention to offer more secure and easier-to-use services to both citizens and companies. The strategy plans to develop digital competences in schools, companies and within the public administration will be increased (Provincia Autonoma di Bolzano – Alto Adige, 2022).

South Tyrol's digital strategy is structured around six strategic goals. The first one addresses ICT infrastructures and foresees the creation of a unique data centre, completing the ultra-broadband network and reinforcing informatic security services and controls on all public portals. The second goal is articulated around the so-called "knowledge ecosystem". It is focused on gathering and qualifying data, ensuring data interoperability to support provincial policies, and mapping data models and sources. For this latter aspect, creating a data scientist team is foreseen. The third objective focuses on the digitalisation of the provincial public administration. This includes the modernization of the hardware and software and the development or simplification of secure public services. That would better respond to users' and operators' demands and integrate better with the national platforms. The fourth objective also deals with services to citizens and companies. It foresees the development and the diffusion of the public services portal myCIVIS, maybe even as a smartphone application, as the single point of access to all public services on the provin-

cial level. This goal is set on the Citizen Relationship Management paradigm and foresees a more proactive delivery of public services. Goal five aims at the amelioration of digital competencies. It focuses on deeper integration and the aspiration to a “shared culture” of innovation and digitalisation among schools, citizens, companies and administration. Finally, the sixth goal strives to create an “innovation ecosystem” for the experimentation and adoption of innovative technologies like the IoT, robotics, AI, Machine Learning, and Computer Vision, in sectors like mobility and transport, tourism, agriculture, healthcare etc. Functional to this purpose, the sixth goal also foresees the facilitation of knowledge transfer between research and industry, with stronger collaborations and open innovation with universities and research centres (Provincia Autonoma di Bolzano – Alto Adige, 2022).

As for the funding, the measures in the document will be mainly funded by the European Union through the *NextGenerationEU*, the *National Recovery and Resilience Plan (PNRR)* and the *European Fund for Regional Development* (Provincia Autonoma di Bolzano – Alto Adige, 2022).

2.5. AGENDA IN ROMANIA

Romania has adopted a *National Strategy on Digital Agenda*. It defines the framework for an institutional structure that will provide a unified vision, centralised management and coordination of all aspects related to the computerisation of public services and the achievement of interoperability at the European level.

The strategy has four main objectives (Figure 6) and identifies the investments required for each area of action, detailing each strategic line of development separately.

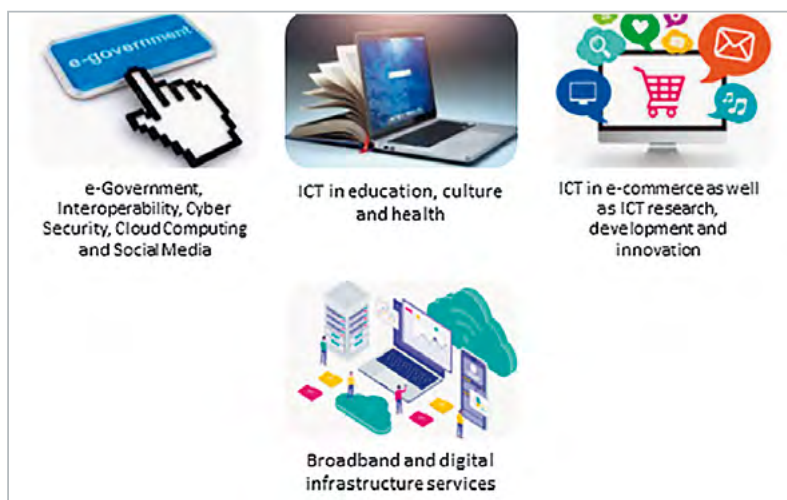


Figure 6: Main objectives of Romania's Digital Agenda

Source: Authors, based on Romania's *National Strategy regarding the Digital Agenda* (<https://www.gov.ro/en/government/cabinet-meeting/national-strategy-on-the-digital-agenda-for-romania-2020>)

The specific measures stipulated in the Strategy had the following specific objectives:

- ensuring citizens' and organizations' access to electronic public services (e-government services);
- improving access to the Internet by increasing the coverage of high-speed broadband electronic communications networks;
- increasing the level of internet usage;
- promotion of electronic commerce;
- increasing the number of cross-border electronic public services;
- increasing digital content and developing ICT infrastructures in the fields of education, health and culture;
- to increase the added value of the ICT sector by supporting research, development and innovation in the field.

Romania's 2020 strategy had as its main objectives the achievement of the following indicators:

- at least 35% of citizens use e-government systems;
- at least 60% of citizens use the internet regularly;
- at least 30% of citizens make online purchases;
- at least 80% coverage with broadband communication networks (over 30 Mbps).

2.5.1. Romania's progress regarding the digital agenda

Given the ambitious targets proposed in the Digital Agenda for 2020, Romania's progress has been slow, according to DESI statistics. More action is still needed regarding e-government and its impact on local authorities. The latest DESI report on Romania's progress in relation to the Digital Agenda (European Commission, 2022c) shows that connectivity is the only dimension of the *Digital Compass* where Romania is close to the EU average.

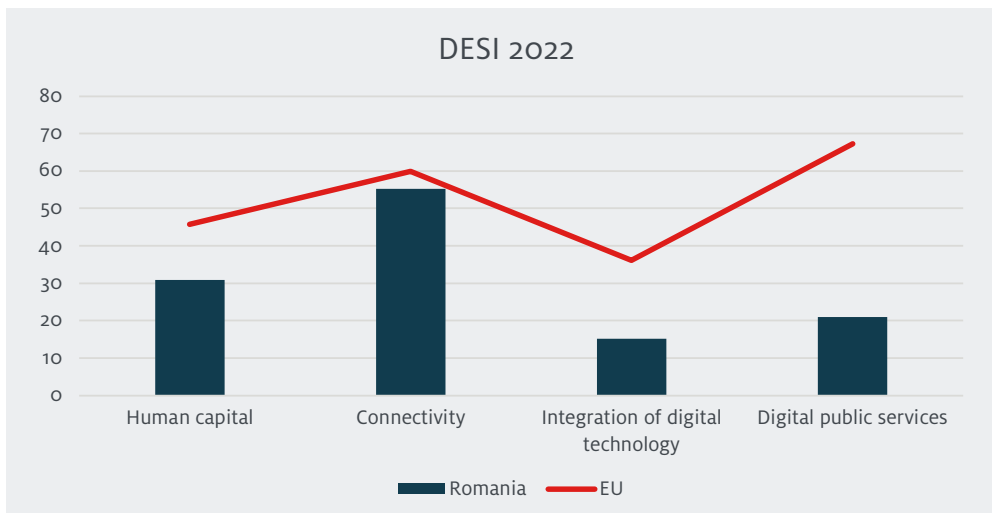


Figure 7: DESI 2022 –relative performance by dimension in Romania
 Source: European Commission (2022c)

Digitalising the public administration is one of Romania's priorities. The aim is to remove bureaucratic obstacles for citizens and businesses and to close the gap with other EU member states.

The current situation regarding digitalisation in Romania is a consequence of the impact of several beliefs, namely:

- the territorial focus led to the fragmentation of the Romanian digital environment and hindered the creation of comprehensive solutions applicable at the national level;
- lack of proactivity in designing useful digital tools at the administrative level and responding to demand with higher costs and lower-quality solutions;
- lack of data sharing between public institutions regarding the information collected on citizens and businesses.

The digital transition in Romania had a bottom-up approach, starting at the municipal level, with good local results, but lacking a top-down national vision and networking at the national and EU levels. Each municipality implemented the digital solutions it was able to develop locally with the resources available.

In the early 2000s, only a few municipalities in Romania had a digitalisation strategy. They implemented various projects funded by public and post-accession funds and co-financed by the local government. The projects focused mainly on digital infrastructure and digital public service delivery.

There are only a few municipalities in Romania where the ITC industry is well-developed and organised. In these municipalities, the public administration's digitalisation level is higher.

Bucharest is one of them, but the level of cooperation between ICT professionals and public administrations could be higher. The municipalities of Cluj-Napoca and Alba Iulia register a higher level of such cooperation, offering two development models for the digital transition that other municipalities can adopt.

One of the problems identified at the level of the Municipality of Bacău, and specific to the majority of Romanian municipalities, is the lack of digital archives. Another problem, even with a digital administration, is citizens' trust in electronically signed documents.

One of the solutions proposed by the mayor of Bacău is to connect the digital platforms of all public institutions and automatically transfer all documents issued to a company or citizen to their digital wallet/file so that the documents are available when needed (Curs de Guvernare, 2021).

A significant achievement of the digitalisation process in Romania is the creation of SEAP (Romania's electronic public procurement system, launched in April 2018). This electronic platform ensures the transparency of public procurement processes and procedures. Through the SEAP platform, public administrations electronically purchase the goods and services necessary to carry out the activity or work for the administrative unit. The official website of SEAP is www.e-licitatie.ro, operated by the Romanian Digitization Authority.

The online public procurement platform SEAP has led to a significant increase in the transparency of public procurement through a considerable increase in the transmission and publication of procurement notices (initiation or award of contracts/framework agreements for public procurement/sectoral procurement/concessions for works or services) in the *Official Journal of the European Union* (OJEU). In 2017, 4,750 award notices sent by SEAP were published in the OJEU. In 2020, 15,215 notices were posted. Of the 201,870 entities in the system, more than 180,000 are economic operators, and more than 21,000 are contracting authorities.

According to the latest digitalisation report (published on the SEAP platform in June 2022), the major challenge for the public administration in Romania remains the reduction of bureaucracy for citizens. In this context, the government cloud project is an important objective that can start a real, deep reform of the public administration in Romania.

The Government Cloud project will be built in a hybrid way, including competitive solutions from technology providers with experience in this area. It aims to connect the Government Cloud to other clouds and the software services hosted in them. The Government Cloud will provide direct benefits to citizens and not only contribute to the digitalisation of the back-end of government. Still, it will also significantly benefit citizens and the business environment.

Interoperability is an essential prerequisite for successful digitalisation and a significant reduction in bureaucracy in the relationship between citizens and public authorities. The

main improvements are related to a better interconnection of the IT systems of the institutions and a faster exchange of data between them, thus increasing the efficiency of the administrative act.

The Interoperability Law (242/2022) will allow a better interconnection between digital systems of public authorities and institutions while facilitating the exchange of data between public authorities, according to the principles of the *European Framework of Interoperability*.

An essential part of Romania's Digital Agenda is increasing government data transparency. Adopting the *Law on Open Data* will bring the benefits of the digitalisation process closer to citizens. It will allow greater transparency of public administration activities, strengthen the free circulation of public information and facilitate communication with public institutions.

Between 2017 and 2022, Romania almost tripled its score in digital public services/e-government. Nevertheless, in 2022 it still ranks last in the EU, with a score of 21.04 points, compared to the EU average of 68.05 points. There is currently no e-ID system available in Romania. "The deployment of e-ID cards and digital signature for Romanians is key in enabling the interactions between public and private bodies and the public" (European Commission, 2022d).

According to the 2022 DESI Report (European Commission, 2022d), RRP-funded investments for the online delivery of critical public services and the development of a single framework for a government cloud system include:

- deployment of the government cloud infrastructure (675 million Euro);
- cloud development and migration (187 million Euro);
- development of e-health and telemedicine (400 million Euro);
- digitalisation of the judiciary (162 million Euro), the environment (52 million Euro), and employment and social protection (85 million Euro);
- implementing electronic forms in public procurement (0.85 million Euro);
- electronic ID card and digital signature (200 million Euro);
- digitalisation of the NGO sector (10 million Euro) and civil service management (10 million Euro).

In 2022, Romania's score on the pre-filled forms indicator was well below the EU average (19 compared to 64 points), while digital public services for citizens and businesses scored almost half the EU score, 44 and 42, compared to the EU's 75 and 82 points.

It is worth mentioning that the *Authority for the Digitalization of Romania* has developed a *Public Policy on e-Government* (Table 2), which was adopted on 3 June 2021. This policy develops digital public services for citizens and businesses and increases the capacity of

public institutions to operate in an advanced digital environment. It also provides mature electronic public services, consolidates the general digital skills of public sector employees and increases the motivation and specialisation level of public sector ICT personnel (European Commission, 2022d).

OBJECTIVE TYPE	OBJECTIVE'S AIM
General objective	Increase the number and quality of digital public services in Romania.
Specific objective 1	Develop digital public services for citizens and businesses at a level of sophistication above four by the end of 2030.
Specific objective 2	Strengthen the capacity of public institutions and authorities to operate in an advanced digital environment and to deliver mature digital public services by the end of 2030.
Specific objective 3	Improve public administration employees' digital skills and continuously increase their IT staff's motivation and specialisation.

Table 2: e-Government public policy 2021-2030 main objectives
 Source: SGG (2021)

There are 14 measures to help achieve these objectives. Here are the main ones:

- establishment and operationalisation of the *Government Hub for Interoperability* at the level of public administration;
- establish the catalogue of national public services and identify the necessary databases for future public e-services;
- establish and operationalise identity management and access to the *Central Software Platform for Digital Identification and Electronic ID Card*;
- large-scale deployment of electronic signatures;
- quantify the need for ICT specialists at the level of public administration and design a national plan to develop their digital skills.

There are three options for dealing with the 14 measures.

- Option 1 implies adopting and implementing the whole package of measures, all 14 of them.
- During the preparation phase of the public policy proposal, the experts of the *Authority for the Digitalization of Romania* estimated a budget of Euro 2.4 billion to implement all measures and strategic actions to achieve the general objective.

- Option 2 aims to adopt and implement only the strategic measures for developing e-government in Romania. The budget for implementing the minimum set of measures for developing e-government is around Euro 2 billion (Secretariatul General al Guvernului României, 2023).
- Option 3 maintains the current status quo without implementing the 14 measures. The development of public e-services will continue as before, without central supervision.

The *National Electronic System (SEN)* is the portal of the Romanian public administration. It is managed by the *Authority for the Digitalization of Romania*. After the update of the content and the graphics in December 2020, the portal provides access to the following:

- information, procedures and assistance and problem-solving services for citizens and businesses in the European Union within the *European Single Digital Gateway* network;
- the contact details of the prominent public institutions in Romania;
- the national register of public institutions in Romania;
- the contact link for submitting tax forms to the ANAF (*National Agency for Fiscal Administration of Romania*);
- the register of accredited certification service providers for the electronic signature (*e-guvernare.ro*).

Artificial Intelligence (AI) will play an essential role in increasing the digitalisation of public administration in Romania. The *Authority for the Digitalization of Romania (ADR)* and the *Technical University of Cluj Napoca* are implementing a project to develop the first national strategy for artificial intelligence. The strategy aims to strengthen public, private and academic cooperation to define the necessary directions for developing and implementing AI solutions in Romanian society and economy. The benefits of using AI technologies for local public administrations are expected to be significant.

In 2022, the PSCID project on the Centralized Software Platform for Digital Identification was launched. It aims to increase the degree of use of e-government services through a unified and simplified method of authentication and access (including SSO - Single Sign On). It also aims to establish the National Electronic Register of Electronic Identities containing the identities of all users of electronic e-government services.

In 2022, the official online payment platform of the Romanian government, *Ghiseul.ro*, has become increasingly attractive to citizens. Between 1 January 2022 and 29 March, more than 1.4 million transactions were processed, with a value of more than RON 520 million (105 million 10 million Euro). Transactions and amounts collected are 10% higher than those recorded in January 2021. *Ghiseul.ro* has become a tool that is increasingly used by citizens, mainly because the pandemic has led to greater use of online services. It is also worth mentioning the change in the way Romanians interact with this public administration tool. Until recently, the platform was accessed from laptops or desktops. Since 2021, more than 65% of those accessing the *Ghiseul.ro* platform to pay for public services, taxes,

panies or utilities have done so from their mobile phone or tablet. This represents a paradigm shift in the interaction of citizens and companies with the public sector. The next step for the *Ghiseul.ro* platform is a dedicated mobile app for smartphones, available for both iOS and Android, bringing *Ghiseul.ro* closer to the citizen.

In 2023, the Romanian authorities aim to launch SITUE - the *Technological Interoperability System with the EU Member States* (as part of a European project worth RON 9,814,178.40, approximately 1.96 million Euro). The implementation of SITUE will allow the establishment of the eIDAS node for Romania and its interconnection with the eIDAS nodes of the other Member States and with the providers of identity and electronic services in Romania. SITUE will be used for the national and cross-border authentication of individuals concerning e-government service providers and enable communication between the national electronic identification infrastructure and other EU Member States' national electronic identification infrastructures.

Although progress is still needed in the digitisation of local administration in Romania, the post-pandemic period has seen an acceleration in the projects developed to achieve the objectives of the *Digital Compass*. The *Authority for Digitization of Romania*, together with the *National Council for Digital Transformation*, remains the catalyst of this process.

The mission of the aforementioned public authorities will be to create a true digital “agora” that will debate and determine the measures that the public administration and the IT industry in Romania must adopt in order to close the gaps between Romania and the other European states.

2.6. AGENDA IN SLOVAKIA

In recent years, the main digitalisation activities in the Slovak Republic have been led by various public authorities, including the central government, municipalities as local self-government units, and municipal unions and associations. These activities have been supported by concrete projects and actions of the non-governmental sector and private companies. Digitalisation in the Slovak Republic can be seen as both a top-down and bottom-up approach.

DIGITALISATION IN THE SLOVAK REPUBLIC	
top-down	bottom-up
Initiated by the central government	Initiated by local authorities
Formulated in strategic documents	Formulated in local strategic plans
Supported by relevant legislation	Supported by local generally binding norms
Realized throughout different levels of government (ministries and central state administration bodies, state-owned companies, transferred to self-governments for execution)	Realized through municipal entities (mayor of the municipality, municipality council, City Hall, municipality companies)

Source: Own elaboration

2.6.1. National digital agenda

The central coordinating role in digitalisation from the central government's perspective is played by the Ministry of Investment, Regional Development and Informatisation of the Slovak Republic (Ručinská and Fečko, 2021). The ministry was established in 2020 as a result of the transformation of the former Office of the Deputy Prime Minister of the Slovak Republic for Investment and Informatisation. The Ministry's tasks in the field of digitalisation are mainly focused on the following areas (Ministry of Investments, Regional Development and Informatization of the Slovak Republic, 2020):

- central management of the informatization of society;
- single digital market policies;
- coordinating the policies and measures to mitigate the negative impact of technologies and digitalisation on society, including the fight against misinformation in the online space;
- administration, operation, and development of the entire state e-government information system;
- coordinating the development of information technologies in the public administration;
- cyber and information security.

In the past, several strategic documents and plans have been adopted in the Slovak Republic concerning different aspects of digitalisation and e-government. Currently, four primary strategic documents aim to shape the future direction of digitalisation in the Slovak Republic.

The **2030 Digital Transformation Strategy for Slovakia** is a nationwide strategy of the Slovak Republic, which defines policies and priorities for the digital transformation of society and economy. The strategy highlights the importance of artificial intelligence, the Internet of

Things, 5G technology, big data and analytical data processing, blockchain and high-performance computing as factors boosting the country's economic growth and competitiveness. The 2030 Digital Transformation Strategy for Slovakia (Ministry of Investments, Regional Development and Informatization of the Slovak Republic 2019) envisions the future digital Slovak Republic as follows:

“By 2030, Slovakia will become a modern country with innovative and ecological industry built on knowledge-based and data economy, with effective public administration ensuring smart use of the territory and infrastructure and with information society whose citizens use their potential at full and live high-quality and secure lives in the digital era”.

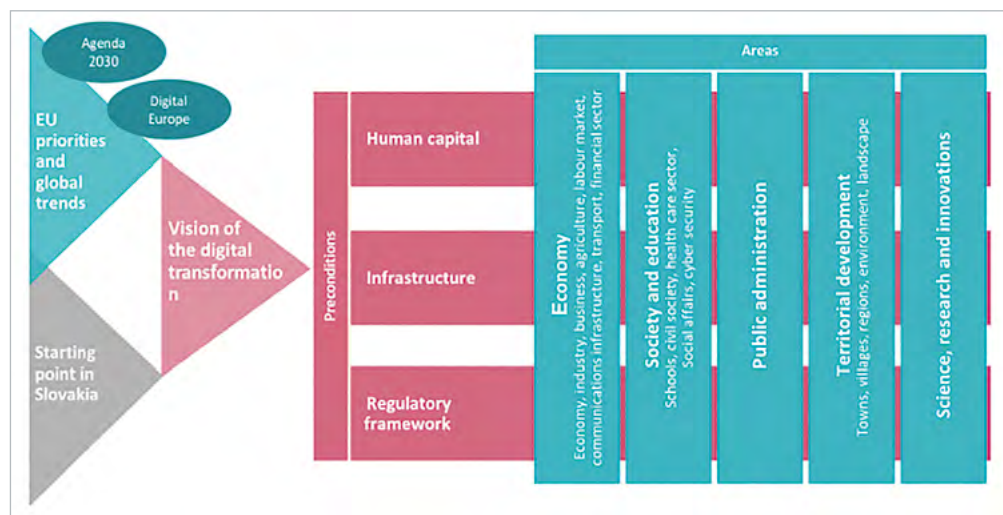


Figure 8: Preconditions and areas of the digital transformation in the Slovak Republic

Source: Ministry of Investments, Regional Development and Informatization of the Slovak Republic (2019)

In the 2030 Digital Transformation Strategy for Slovakia, preconditions, as well as areas of intervention for digital transformation, have been identified:

Preconditions

- human resources (educated and skilled labour force that can utilize the potential of the digital era)
- infrastructure (complex of necessary technologies, solutions and systems)
- regulatory framework (framework for legislative regulations and the way of functioning).

Areas

- economy (economy, industry and agriculture adapted to the needs of the digital era; businesses using innovations; robust, functioning and secure communication infrastructure; smart transport; progressive financial sector providing financial innovations)
- society and education (modern and high-quality education for the information society build-up; advanced and inclusive civil society; fully digitalised health care using innovations; Flexible and innovative social policy; cyber security)
- public administration (public administration that innovates; public administration with sufficient capacities and culture of invention; public administration using data and artificial intelligence; European dimension of public administration informatization)
- territorial development (Smart City as the way to a modern and smart territorial development; high-quality participative territorial planning that uses data and innovations)
- science, research and innovations (functioning ecosystem for research, development and innovations; emphasis on actual results in science and research).

The *2030 Digital Transformation Strategy for Slovakia* is seen as a government strategy to bring the entire society, the economy and the functioning of the public administration into the 21st century in order to be able to use the full potential of the digital age. This requires a comprehensive approach involving different levels of government, other stakeholders and the public.

The **Action plan for the digital transformation of Slovakia for the years 2023-2026** is directly derived from and linked to the 2030 Digital Transformation Strategy for Slovakia, as well as strategies adopted in the past. The Action plan sets out concrete measures that can be implemented starting from 2023 in the areas of:

- digitalisation of the economy (digital transformation of businesses)
- digital infrastructure (infrastructure, high-performance computing, quantum technologies)
- support of the artificial intelligence potential (artificial intelligence applications)
- digital society (support of women in the digital economy and society, impact of digitalisation and harmful online content on mental health, green and digital transformation, decentralized recording technologies and financial innovations).

The **strategy and action plan for improving Slovakia's position in the DESI index until 2025** is an example of how different the approach to digital transformation can be. It aims to improve the Slovak Republic's position in the Digital Economy and Society Index. The strategy highlights that the Slovak Republic is improving its digitalisation, but at a slower pace than other more digitally advanced countries. The goal is to advance the position of the Slovak

Republic in the DESI index to at least reach the EU average and to move to the middle of the ranking within the next five years.

The **National digital skills strategy of the Slovak Republic and Action plan for the years 2023-2026** supports the overall ambition of the Slovak Republic to realize digital transformation as the highest priority. The Strategy and Action plan analytically elaborates and sets out priorities for improving digital skills by identifying key areas of institutional background (governance model), ICT specialists, digital skills of young people and teachers in the educational process, digital skills of active labour market participants, the share of girls and women in ICT, digital divide and digital exclusion.

In line with the digital transformation activities, the Slovak Republic is also trying to improve its e-government, which is seen as part of the digitization of society. The central e-government portal slovensko.sk is managed by the Ministry of Investments, Regional Development and Informatization of the Slovak Republic and administered by the National agency for network and electronic services.

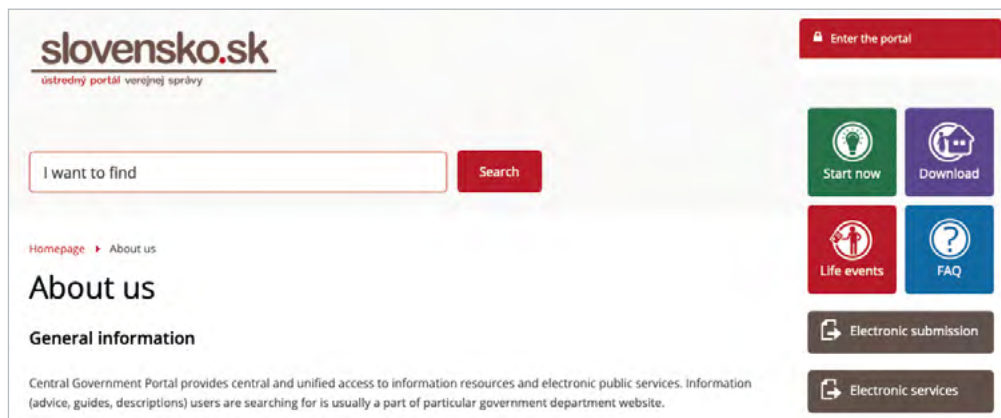


Figure 9: Central e-government portal slovensko.sk
 Source: Ministry of Investments, Regional Development and Informatization of the Slovak Republic (n.d.)

The central e-government portal slovensko.sk serves as the single entry point to information resources and for concrete public e-services of all departments and levels of public administration. Users can find information about public services and solve their problems directly. Navigating the portal is based on life events, such as housing, travel, transport, finances, culture, citizens and the state, business, family and relationships, employment, health, etc.

2.6.2. Digital agenda at the local level

Digitalisation in the Slovak Republic is triggered not only by the activities, plans, strategies and programmes of the central government, but other public authorities at the local level also play an irreplaceable role in this respect. Individual municipalities and associations of municipalities support existing digitalisation trends and activities and put into practice state-of-the-art solutions that contribute to the digitalisation of society in the Slovak Republic.

Digitalisation at the **municipal level** has historically been motivated by legal obligations set by the central government and as a natural decision of a particular municipality about its further development. The central government, according to the E-Government Act (Act No. 305/2013), set the obligation for every public authority to provide its services digitally starting from 1 November 2016. Every municipality, regardless of size, had to comply with the government's obligation and provide its municipal services using ICT. Some municipalities have developed unique in-house solutions, while others have used market-ready portals that they use as a third-party service.

Municipalities in the Slovak Republic see digitalisation not only as a must to fulfil legal obligations or as a challenge but also as an opportunity to streamline and make the provision of public services to their citizens more effective. Small and medium-sized municipalities, in particular, can use digitalisation to better manage their responsibilities, improve their municipal management, make better use of financial and human resources, and improve the quality of public services provided and the quality of life of their citizens. There are several examples of how municipalities have approached local digitalisation. This, in turn, has stimulated the digitalisation of society as a whole:

- publicly available Wi-Fi connectivity;
- municipal e-services portals;
- open data management and open data portals;
- specific smart city solutions;
- projects to support digital skills for the inhabitants, also targeting different groups of disadvantaged inhabitants;
- Covid-19 response activities, such as electronic registration systems for testing.

Municipalities in the Slovak Republic play an essential role in the overall digital transformation of society. They are much closer to the everyday lives of citizens, and local authorities tend to enjoy higher levels of public trust. Municipalities are involved in digital transformation as contributors to nationwide activities and as sources of unique local solutions.

2.6.3. Digitalisation and the role of unions

The Slovak Republic is characterized by a very fragmented spatial structure with a total of 2,890 municipalities. Municipalities in the Slovak Republic are grouped into two main **municipal unions/associations**, the City Union and the Association of Towns and Communities of Slovakia (Ručinská and Fečko, 2020). The City Union (City Union, 2023) was established in 1994 and currently has 60 members (there are a total of 141 municipalities in the Slovak Republic). The Association of Towns and Communities of Slovakia (Association of Towns and Communities of Slovakia, 2023b) was established in 1990 and currently has 2,784 members (including 131 towns). The fact that the vast majority of municipalities are members of unions/associations underlines the importance of these groups when it comes to the everyday tasks, activities and challenges of municipalities, including those related to digitalisation. Based on the activities of the union and association and according to the Association of Towns and Communities of Slovakia (2023a), several examples can be given of how the unions/associations play an essential role in digitisation:

- the first contact point when new legislation is adopted, and policies have to be introduced;
- a place for the exchange of experiences and good practices between municipalities;
- mediator between the central government and municipalities;
- seminars and workshops for improving digital skills in the municipalities;
- electronic system for Ukrainian war refugee management;
- digital restart project as a platform for raising awareness of digitalisation and helping municipalities with practical digitalisation solutions;
- preparation of manuals for online municipality council's meetings during pandemic restrictions;
- introducing own electronic registration systems for Covid-19 testing.

Municipal unions in the Slovak Republic play a key role in implementing new policies and adopting new legislation. Therefore, it is expected that the know-how, collection of good practices, instructions, explanations, and statements of the municipal unions will also make an important contribution to the success of the digital transformation.

3.

Methodology

3. Methodology

Given the importance of digital transformation in the public sector – especially on the local level and in direct contact with the population – this project identified and documented municipal good practice examples.

A unified approach based on a common methodology was chosen among the project partners to ensure that the examples would be comparable and structured in a way that is easily understandable by practitioners in the field. Political and administrative representatives should be able to use this handbook as a source of practicable, real-world ideas to help solve digital issues and get an idea of the involved costs and necessary resources for their implementation.

To achieve this goal, the project partners established a multi-step approach consisting of initial desk research and preliminary interviews to identify possible good practice cases. This was followed by in-depth interviews to explore the cases in detail.

3.1. **DESK RESEARCH & IDENTIFICATION OF PARTNER MUNICIPALITIES**

The first step was not the selection of specific best practice projects but identifying municipalities willing to participate in the project. The four project partners selected the municipalities based on national circumstances and experience:

Austria

The City of Linz was selected because it is well-known for its innovativeness. For instance, it was recognized when the city won the *UNESCO City of Media Arts* award in 2014. Kremsmünster was chosen because it has been a frontrunner in digitalisation for decades and because of its highly open-minded and innovation-friendly local administration. Finally, the think tank “Oö. Zukunftsakademie” was selected for this project because it is a modernization and digitalisation driver in Upper Austria.

Italy

As Eurac Research has a research focus that is mainly local, the emphasis of desk research was concentrated on the local level of the Autonomous Province of Bolzano – South Tyrol. It was combined with established partnerships to better access information and reach for involved authorities. The regional focus is still precious: it delivers examples from small and mainly rural municipalities settled in an alpine context with low inhabitant density. These challenging conditions for digitalisation might differ from big urban centres, where private partners are also more willing to invest.

Romania

Choosing the municipalities to provide good examples was a challenging task that required discussions among the members of the Romanian DiGreen team. During these discussions, we identified a range of municipalities that met the proposal's requirements and contacted them directly afterwards. Initially, we identified four cities that sent us support letters: Bacău, Berbești, Curtea de Argeș and Bucharest, District 5. Along the process, a few new municipalities supported the project. They provided good examples that were finally selected, namely Giurgiu, Gura Humorului and Mărcănești.

Slovakia

The municipalities and cities from the Slovak Republic, acting as the source of good digital examples, were chosen based on previous experiences and cooperation with the team from the Pavol Jozef Šafárik University in Košice. The team experienced previous collaboration with the City of Kežmarok on several occasions during past projects and preparation of scientific articles presented at international scientific conferences. The City of Košice was selected because of an intended variety of good digital examples, whereby the city's model performs as a unique way of civic engagement using digital technologies.

Once the municipalities had been selected and their willingness to participate in the project had been confirmed, desk research was carried out, followed by preliminary interviews. The aim was to get a first overview of digital trends and digital projects initiated in recent years.

3.2. PRELIMINARY INTERVIEWS

Initial desk research allowed the identification of possible partners and potential projects for this report. First contact via e-mail or phone call followed to ask whether the municipality was interested in sharing their experiences and if they would be available for an extended interview.

The interview partners for these interviews were usually the municipality's political representatives, often the mayor or municipal officer for digital affairs. When the interviewee confirmed the municipality's willingness to participate in the project, the interviewer started with non-leading questions to identify projects in the digital realm that the municipality deemed particularly noteworthy. The interviewer then brought up the examples identified via desk research and asked explicitly about their validity as good practice cases. The interview concluded by jointly selecting one of the discussed examples as the municipality's good practice case.

In selecting the projects, care was taken to ensure that they would be applicable to other municipalities and that there were projects covering as many different issues as possible. For example, the "Innovationshauptplatz" (Linz) was chosen because it is an excellent example of citizen participation. Similarly, Amazon's "Alexa" voice input and output system (Kremsmünster) was selected because it is of great value to people who may have difficulties with reading and writing.

Once decided on the case, the researcher identified candidates for the in-depth interviews: Besides the municipal authorities, people directly involved in the project were also interviewed for more detailed insights.

If possible, an appointment for the following interviews was immediately set up. Alternatively, the municipal representative was asked to put the researcher in contact with the interview partners to find an appointment.

In both cases, an email with further information about the DiGreen project and a short summary of the preliminary interview followed.

3.3. IN-DEPTH INTERVIEWS

The in-depth interviews were conducted in person, and they were mainly individual. The research team conducting the interviews consisted of two persons: one moderator leading the interview and asking questions and one further person coding and writing notes. Interviews were not recorded, yet transcribed with details during the interview itself. The interviewees also provided additional material, which was then integrated with the interview transcriptions.

The interviews were semi-structured. This approach allowed as much space as possible for the project's peculiarities. At the same time, a general structure among all project partners ensured the collection of all relevant aspects needed to construct comparable best practice cases. In particular, the following aspects were covered in all interviews:

- the project's starting point and background;
- goals and objectives of the project;
- possible solutions that have been explored and which one has been chosen (and why);
- implementation phase;
- project results and the situation today;
- cost of implementation;
- in hindsight: lessons learned and recommendations.

Usually, for each good practice example, numerous people were interviewed. This way, different aspects could be explored in greater depth. While all elements were broached with every interviewee, the knowledge about specific topics depended on the person's role in the project. For example, the mayor or political representative of the municipality was usually an excellent source for the needs and goals of the project. In contrast, the administrative

personnel operatively involved in the project could usually provide additional insights regarding the implementation phase as well as the costs of the project.

We posed no time limit, so the interviews ended naturally once both moderators and the participants felt all issues had been adequately covered.

With this information, the best practice scenario could be described in the foreseen way.

4.

Good practices

4. Good practices

This chapter presents all the DIGITAL Good Practice examples identified during the DiGreen project. All cases are structured similarly to allow for easy comparison. Furthermore, the structure is intended to help practitioners easily identify examples that could interest their municipality and the critical success factors, costs, and challenges that might arise when implementing them.

The Good Practice examples span a wide variety of topics. While no case concerns just one aspect, the examples can nonetheless be grouped according to their main topics and goals:

IoT and Smart Solutions

The Internet of Things (IoT) consists of interconnected computing devices that can transmit data and communicate over the Internet without the need for human interaction. This enables the creation of Smart Solutions that offer new services or improve the quality and reliability of existing ones.

- The City of **Kežmarok (Slovakia)** carried out a pilot project to use sensors measuring the fill level of waste bins to manage its waste management system.
- **Luson (Italy)** realized a district heating plant that not only supplies the village with cost-effective heating and hot water but also employs sensors to detect and locate damage in the pipes. Furthermore, the smart system allows for decentralized adjustments at the customer's request.

Asset Management

Municipalities manage many assets – from buildings to infrastructure like pipelines, fibre optic cables, roads, sidewalks, parks and many more. Modern, IT-based asset management systems allow for efficient public goods administration and provide the information necessary to formulate public policies and communicate with the public about interventions and investments.

- The Municipality of **Lana (Italy)** uses the Energy Report Online software: a tool that records the annual water and energy consumption of all public buildings and facilities. The ERO is an important tool for decision-makers that can help reduce consumption and costs.
- The City of **Kežmarok (Slovakia)** has created a Geographic Information System (GIS) that maps the city's entire infrastructure, including GPS coordinates for all pipelines, fibre optic cables, buildings, roads, sidewalks and parks, trees and other greenery.
- The Municipality of **Naturno (Italy)** developed a digital pipeline register to manage the municipality's water and wastewater pipeline network, the street lighting network, and the district heating and fibre optic networks.

- The City of **Košice (Slovakia)** has directly involved its residents in the winter maintenance of sidewalks, using the Adopt a Sidewalk principle. The city developed a smartphone app to manage the community of participating residents.

Citizen Contact

IT systems allow for new ways of communication between the public administration and its citizens. They allow for new forms of community outreach and the inclusion of citizens in the decision-making process.

- The Municipality of **Kremsmünster (Austria)** developed a voice input and output system as a skill for Amazon Alexa to provide additional services to the citizen.
- The project “A town hall closer to people at a click away” improves the decision-making process, strategic planning and budget execution, as well as the quality and performance of the management of Sector 5 of the Municipality of **Bucharest (Romania)**.
- **Kremsmünster’s (Austria)** Electronic Official Board makes it possible to provide citizens with digital information about the municipality and ordinances.

Security & Safety

Digitalisation can help increase safety and prevent crime through systems such as video monitoring apps that allow citizens to quickly contact and require assistance when needed.

- The Municipality of **Gura Humorului (Romania)** developed a video monitoring system for key areas in town, improving public safety, environmental pollution, and traffic flow.
- The City of **Kežmarok (Slovakia)** has developed a mobile phone security app that is connected to the camera surveillance infrastructure of the City Police. The project combines modern information and communication technologies with City Police interventions.

Administrative Efficiency

Last but not least, digitalisation plays a fundamental role in improving the efficiency and effectiveness of municipalities’ internal processes, reducing bureaucracy, and providing administrative simplification for the citizens.

- The Municipality of **Bacău (Romania)** has launched a project to implement innovative digital systems to simplify the delivery of services to citizens and to digitise the municipal archive.
- By implementing process management in **Linz (Austria)**, the local administration strived to become an administration that focuses on its client’s needs and demands.
- The Municipality of **Giurgiu (Romania)** implemented a project to increase the institutional capacities regarding fundamental decisions and strategic planning in the long term and reduce bureaucracy for services provided to the community.

4.1. IOT WASTE MANAGEMENT IN THE CITY OF KEŽMAROK



Short Summary:

The City of Kežmarok carried out a pilot project to implement an Internet of Things in the waste management system. Based on the results, the city expanded its goals by formulating a more extensive and specific strategy for integrating the Internet of Things into public services and infrastructure. The city's overall goal is to improve its residents' quality of life and services.

In addition to introducing the *Program of Economic and Social Development of the City Kežmarok 2014 – 2020* as a medium-term strategic document of the city, the City of Kežmarok developed the *Idea Concept Smart Green City Kežmarok* in 2017. The *Idea Concept Smart Green City Kežmarok* was prepared as a comprehensive strategic document linking digital goals with the city's green goals. This allowed the city to formulate clear strategies and visions for its future development. Modernisation and digitalisation processes should be implemented in synergy with environmental protection issues. This allows the city to develop in line with improving the quality of life for its inhabitants.

4.1.1. Goals of the project

Participation in the *IoTxChange* project aligned with the city's goals to become a smart green city. The *IoTxChange* project was realised from October 2019 to August 2022. It was supported by the European regional development fund, Operation programme Urbact III (Kežmarok, 2022b).

The project's goal was the international exchange of experiences, new modern trends and challenges in the field of digitalisation in cities based on the Internet of Things (IoT). The city's participation was aimed at implementing a small-scale action in waste management using IoT technology (Kežmarok, 2022a).

4.1.2. Existing solutions considered by the municipality

The City of Kežmarok was approached by the *IoTxChange* project based on the city's existing strategy, the *Idea Concept Smart Green City Kežmarok* (Kežmarok, 2022a). This allowed the city to develop existing ideas in practice within an international cooperation of different cities.

4.1.3. Implementation phase

The City of Kežmarok formed a local action group consisting of seven members. Five of whom were employees of the city, one member was a representative of the national contact point for Urbact in Slovakia, and one member was from a private company. The local action group was responsible for preparing and implementing the small-scale action and for the overall evaluation of the project results and follow-up activities.



Figure 10: GSM network container filling sensor
Source: Kežmarok (2022c)

The small-scale action (Salvado, 2022) in the City of Kežmarok was prepared as an experiment using new digital technologies based on IoT. The city focused on waste management by introducing waste bin sensors in selected densely populated parts of the city. The implementation phase was characterised by the following:

- The decision of the local action group to measure the fullness level of the bins in the city.
- Public procurement of technical equipment (ultrasonic sensors for waste container filling + real-time data display system). A total of three companies were contacted to provide services within the scope of the contract, and the winning bid was selected based on the lowest bid.
- Installation of 22 sensors in 6 locations.
- The duration of the small-scale action was July 2021 - December 2021.
- Evaluation of the small-scale action.

4.1.4. Project results

After the small-scale action, the city gained valuable experience and data, from which it was able to formulate several key findings:

- The city didn't have the necessary IoT network coverage, so GSM sensors were chosen. This put a strain on the battery life of the sensors, and some of the sensor functions could not be fully explored.
- High entry cost for IoT implementation across the city.
- Long-term return on investment.
- Some sensors malfunctioned, and the vendor/manufacturer wasn't able to resolve the issues.
- Real-time data transmission and display on the management platform.
- Effective waste collection and route planning based on real-time data on bin levels.
- Possible loss or damage of sensors.

The small-scale action as a test project brought results and experience to the city, which led to the formulation of the *Integrated Action Plan (Internet of Things for a better life)*. The *Integrated Action Plan* identified two main areas, focusing on public services and infrastructure, where the implementation of IoT technology will be realised.

IoT in public services	Smart management of public lighting CCTV system Pedestrian crossings Parking system Smart municipal waste management
IoT in infrastructure	Information system Electromobility

Table 3: IoT fields of the Integrated Action Plan for the city
Kežmarok
Source: Markočiová and Cintula (2022)

IoT waste management as an integral part of the *IoTxChange* project will be developed into a complex system involving the local government, the waste collection company and the residents. The local government will have real-time data and statistics about the waste production of each individual waste producer (household). Waste bins and bags will be

equipped with chips or QR codes to track waste production. Publicly available bins will have a digital locking mechanism to prevent unauthorised dumping. Accurate statistics of waste production will be linked to waste payments.

4.1.5. Cost of implementation

The total budget for the City of Kežmarok in the *IoTxChange* project was 65,567.06 Euro, which was used during the project implementation. This budget included the establishment of the local action group, the implementation of the small-scale action and the development of the *Integrated Action Plan*.

The *Integrated Action Plan* defined specific budgets, funding sources, timelines and responsibilities for each of the seven actions.

ACTION	BUDGET SOURCE	BUDGET
Smart management of public lighting	City Kežmarok Integrated Regional Operational Programme	395,000 Euro
CCTV system	City Kežmarok Integrated Regional Operational Programme	190,000 Euro
Pedestrian crossings	City Kežmarok Integrated Regional Operational Programme	76,000 Euro
Parking system	City Kežmarok Integrated Regional Operational Programme	80,500 Euro
Smart municipal waste management	City Kežmarok Integrated Regional Operational Programme	210,000 Euro
Information system	City Kežmarok Integrated Regional Operational Programme	125,000 Euro
Electromobility	City Kežmarok Integrated Regional Operational Programme Operational Programme – Quality of Environment	380,000 Euro

Table 4: Funding sources for the Integrated Action Plan for the city Kežmarok
Source: Markočiová and Cintula (2022)

4.1.6. In hindsight: lessons learned & recommendations

The City of Kežmarok continues to fulfil its overall goal of integrating modern technologies to be smart or digital and to develop the city within the sustainability and environmental protection framework. The introduction of IoT in waste management as a small-scale action brought insight into the usability of IoT in the city. Based on this knowledge, international exchange between cities and the experience gained, the city formulated a much broader IoT strategy for the coming years.

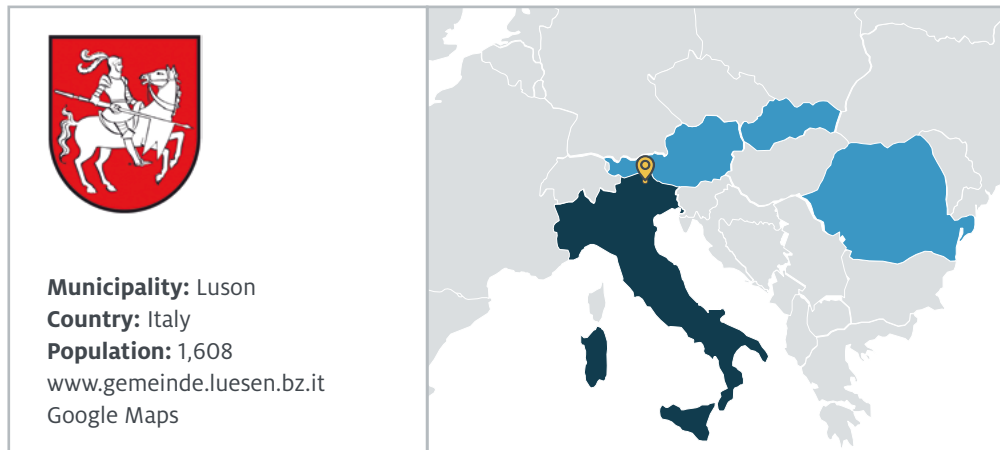
The City of Kežmarok sees several benefits in using IoT technology, but it also brings new challenges. In the field of waste management, the introduction of IoT means irregular waste collection routes, as they are managed by data on the fullness of waste bins. This irregularity creates a challenge for residents to get used to collecting bins based on need rather than a specific day of the week.

The *Integrated Action Plan* for IoT in the City of Kežmarok lays the foundations and sets a strategy with specific activities, measurables, impacts, timelines, budget and responsibilities that the city will follow in the follow-up projects. The city's cooperation in the *IoTx-Change* project was particularly beneficial because different cities were exploring different ways of integrating IoT in each city. Thus, the mutual learning and sharing of experiences in an international environment allowed the city to gain a broader set of good practices for future follow-up projects.

WHAT CAN BE LEARNED?

- The benefits of international cooperation between cities and the experiences exchange when introducing highly innovative and modern solutions.
- The initial smaller project gained valuable data, based on which the city could formulate its next steps.
- Formulating future strategies, converted into specific actions with timescale, measurables, responsibilities, budgets, and funding sources, is necessary for tracking and making desirable progress.

4.2. SMART HEATING FOR THE ENTIRE VILLAGE IN LUSON



Short Summary:

The Municipality of Luson realized a district heating plant that supplies the village with cost-effective heating and hot water and employs sensors to detect and locate damage in the pipes. Furthermore, the smart system allows for decentralized adjustments at the customer's request.

In 2007, the Municipality of Luson realized a state-of-the-art district heating plant. Since then, all public buildings and most private homes and businesses in the village centre have been supplied with heating and hot water.

The major technical challenge was not the heating plant but the district heating network, which is over 5 km long. On the one hand, extensive excavation had to be carried out in the historically grown village centre to lay the necessary pipes. On the other hand, the municipal area of the mountain community of Luson is not flat but strongly inclined. A correspondingly powerful pumping system was required for water circulation.

Luson based the project on a - especially for the time - advanced digital monitoring system for efficient and sustainable operation of the district heating plant. The plant itself is equipped with modern computer technology for fully automatic operation. The district heating pipes are fitted with monitoring wires that report a water loss and enable the location of the damage. In addition, all heat transfer stations in the apartments and businesses are connected to the heating centre via data cables. This means that not only can the meter readings be read centrally, but adjustments can also be made to the heating systems at the customer's request. Finally, the excavation work was used to renovate the existing water and wastewater pipes and to lay empty conduits for the fibre optic network. This was done in 2006-2007, almost a decade before the province of South Tyrol set fibre optic connectivity for all households as a goal.

4.2.1. Goals of the project

The Municipality of Lusón faced the challenge of renewing the heating systems of several public buildings. A central solution was envisaged, but this would not have been profitable only for the public buildings. So the idea was born to connect private households and companies and realize a district heating plant for the whole village.

After feasibility studies showed that a district heating plant was technically feasible even in an area with slopes, the implementation was planned. The goal was a technically modern, digitally controlled system that was the optimal size for the catchment area. For Lusón, the district heating plant needed to be self-supporting through the fees collected and not burden the municipal budget. Households not connected to the district heating network should not have to pay for it indirectly through taxes.

The heating plant also primarily burns wood chips that come from local forests. This provides additional support for the community's farmers. Finally, the plant is equipped with modern filters that reduce environmental pollution to a minimum.

4.2.2. Existing solutions considered by the municipality

Initially, a heating plant powered by bio-gas was envisaged. However, in order to stimulate the local circular economy, a biomass plant for firing wood chips from the community's forests was chosen.

There was also the question of whether the municipality would have to operate the district heating plant. A cooperative was considered an alternative, but there was too little private initiative.

4.2.3. Implementation phase

After extensive planning, the construction of the district heating plant began in 2006. The building took a year but was a significant burden for the population. Not so much the construction of the heating plant itself but the extensive excavation work throughout the village to lay the pipes for heat distribution. This work was unavoidable and used to renovate existing pipes and make the community fit for the digital future by laying empty pipes for the fibre optic network.

4.2.4. Project results

Today, the district heating network is very well accepted in the community of Lusón, and most households in the catchment area are connected. The plant has been upgraded several times and is slowly reaching its capacity limits. However, this was planned so that the user fees could cover the original investment and the management and maintenance of the plant.

The system's digital control, which enables fully automatic operation and automatic reporting of faults or malfunctions, contributes significantly to this as well.

At first glance, private households have comparable annual heating costs to their own heating system but save all maintenance and servicing costs. The local circuits mean the district heating plant is far less affected by the current energy crisis.

4.2.5. Cost of implementation

The total construction costs for the district heating plant amounted to about 3.6 million Euro. Of this amount, the municipality received a contribution of 1 million Euro from the Province of South Tyrol; 2 million Euro were financed by a loan and the rest from connection fees and the municipality's own funds.

The initial investment and ongoing operation and maintenance are financed by user fees and do not burden the municipal budget.

On the other hand, significant savings were achieved by rehabilitating existing lines and laying empty pipes during excavation work for the district heating network. The municipality estimates that around 1 million Euro in costs were avoided in the fibre optic expansion alone.

4.2.6. In hindsight: lessons learned & recommendations

The community of Luson is content with the realization of the district heating plant. A business plan must be worked out before the investment: It is necessary to calculate precisely how many customers are expected to dimension the plant correctly. All investment and follow-up costs, as well as depreciation, must be taken into account. The district heating plant is currently fully self-financing.

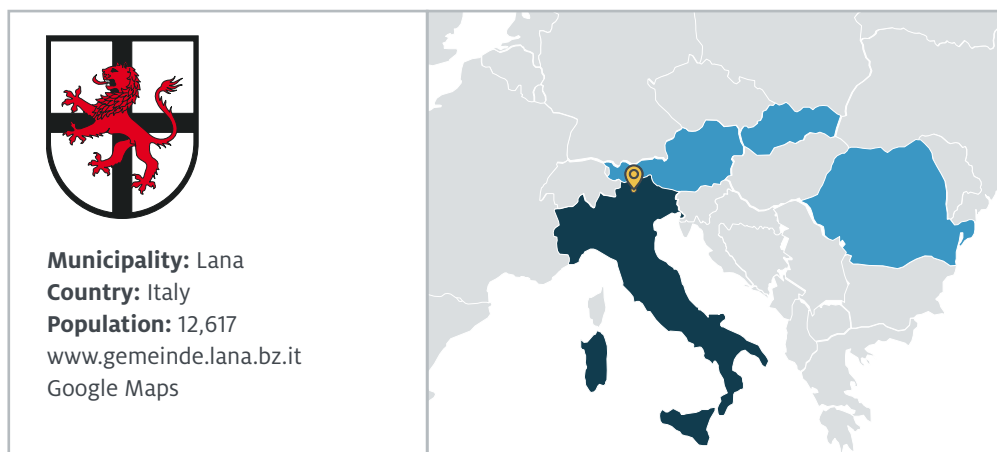
This results in a win-win situation: The municipality achieves savings because it no longer has to maintain and renew the heating systems of the public buildings individually. Private households and businesses can also use the inexpensive district heating. In addition, the local economy is stimulated, and local cycles are strengthened because wood chips from the community's forests are primarily burned. Finally, modern filters can be used in a central incineration plant to minimize environmental pollution and thus enable smart, sustainable heating.

Luson has shown how a project can create added value for the community and municipality beyond digitalisation: Support for the local economy, a contribution to energy self-sufficiency and thus security in times of crisis, and environmental benefits not only from modern filters during combustion but the purchase of wood from local forests, which helps to ensure that they are managed sustainably and thus kept healthy. The project management itself is also exemplary, especially the foresight to create space for future technologies such as fibre optic connectivity for all households.

WHAT CAN BE LEARNED?

- A comprehensive business plan that takes into account all the costs is fundamental for every project.
- A district heating plant can generate savings as the municipality no longer has to maintain and renew the heating systems of the public buildings individually.

4.3. TRACKING THE MUNICIPALITY’S ENERGY CONSUMPTION WITH THE ENERGY REPORT ONLINE IN LANA



Short Summary:

The Municipality of Lana uses the *Energy Report Online* software. This tool records all public buildings and facilities’ annual water and energy consumption. The ERO is an essential tool for decision-makers that can help reduce consumption and costs.

The *Energy Report Online* software, or ERO for short, was designed specifically for municipal administrations. The ERO is a practical tool that supports “*KlimaGemeinden*” (*ClimateCommunity* – see Lana’s example in the handbook of GREEN good practice) in recording their resource consumption. It records all public buildings and facilities’ annual water and energy consumption. The ERO collects data on the energy production of community-owned facilities and balances the emissions of greenhouse gases produced in the community. All data are summarized in an end-of-year technical report. The annual recording of consumption and greenhouse gas emissions helps municipalities define fields of action and savings potential more efficiently and make sustainable decisions regarding energy and climate protection (Agency for Energy South Tyrol – CasaClima, n.d.).

The energy report collects and evaluates the following data (Agency for Energy South Tyrol – CasaClima, n.d.):

- energy and cost distribution of public buildings;
- distribution of energy sources;
- the proportion of renewable and non-renewable energies in the municipality;
- presentation of development trends.

The ERO was initially developed by the “*Energieinstitut Vorarlberg*” (Vorarlberg Energy Institute) and adapted for use in South Tyrol by the “*Agentur für Energie Südtirol – KlimaHaus*” (Agency for Energy South Tyrol), in collaboration with the “*Ökoinstitut Südtirol*” (South Tyrol Eco-Institute) (Agentur für Energie Südtirol - KlimaHaus, 2016).

Not only thematically but also because of the actors, the ERO is thus closely linked to the “*KlimaGemeinde*” project of Lana (see handbook of GREEN good practice). Even though sustainability is the primary goal, the focus of this project is on the digital component:

The *Energy Report Online* is an internet-based application. The municipality registers its buildings, objects, facilities, and energy supply structure and then records the consumption values annually. The software then enables an overall view of the consumption and cost development and a detailed presentation of individual objects at any time. In addition, a comparison with other municipalities that also use the ERO is possible.

By providing a comprehensible report on the nature and development of energy consumption, the ERO becomes an important tool for decision-makers that can help reduce consumption and costs (Agentur für Energie Südtirol - KlimaHaus, 2016).

4.3.1. Goals of the project

The ERO was introduced in Lana together with the “*KlimaGemeinde*” program. The aim was to make the energy consumption of the public facilities of the Municipality of Lana transparent. Specifically, the objective was to create a permanent possibility for review and controlling. The data collected this way served as a basis for well-founded decisions. At the same time, the data was also to be used for external communication in order to show the citizens where there is a need to catch up and where there is a need for improvement.

The software ERO was recommended by the *Ökoinstitut Südtirol* and accepted. The expert in the municipal committee also favoured the tool due to the improvement in energy efficiency. Alternative software solutions were not considered.

4.3.2. Implementation phase

The introduction of the *Energy Report Online* went hand in hand with the certification as a “*KlimaGemeinde*”. Right at the beginning of the project, the Municipality of Lana called in an **external consultant**, the *Ökoinstitut Südtirol*. They recommended the ERO software and supported Lana during the implementation.

As a first step, the municipality’s **facilities and buildings had to be entered into the system** and assigned to typologies (e.g. administrative buildings, schools or street lighting). These will later enable a better benchmark of energy consumption.

Subsequently, the annual **heat, electricity, water and fuel consumption was recorded** for the first time.

4.3.3. Project results

The first energy report from the ERO was created in 2017, the year of implementation. The system was further maintained and expanded, and the annual consumptions continued to be recorded. The current energy report 2021 shows the following picture of energy consumption:

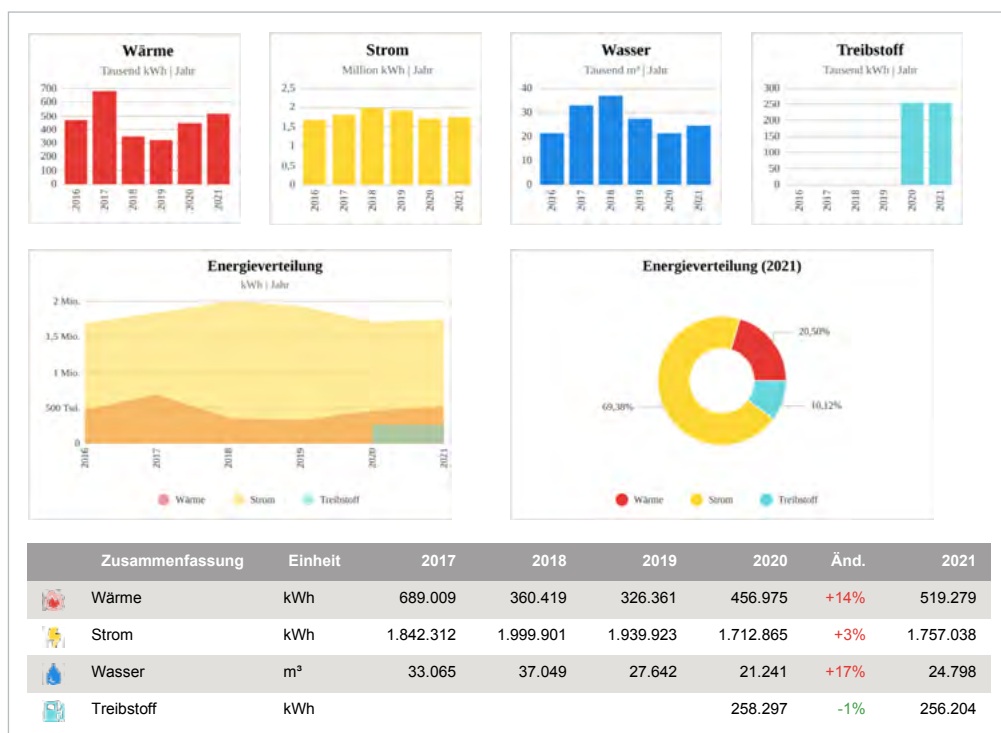


Figure 11: Energy Report Online – Lana’s energy consumption in 2021

Source: *Marktgemeinde Lana (2022)*

The ERO has increased awareness among the municipality’s political representatives and employees about sustainability and energy saving. The energy report was also presented to the citizens to raise their awareness.

The improved information situation has also served as a basis for decision-making. For example, the most prominent “energy guzzlers” could be identified, and the community’s modernization and refurbishment projects were prioritized accordingly. In many cases, the increased awareness also made it possible to change user behaviour and thus achieve savings.

Finally, leaks and errors can be identified and eliminated more quickly through permanent monitoring.

4.3.4. Cost of implementation

The ERO adoption and continuous use are closely linked to the accreditation as a “*KlimaGemeinde*”. The assistance in the initial recording of the buildings and facilities, ongoing registration of the consumption and derivation and processing of the results takes place within the framework of the program support by the *Ökoinstitut Südtirol*. The costs of this external consulting amount to about 5.500 Euro per year.

The internal administrative workload is difficult to quantify but remains within reasonable limits. In the initial phase, the municipal technicians were particularly challenged: They had to record the buildings and facilities in the system and enter the basic descriptions of the objects (e.g. the square meters) once. During operation, the accounting staff enters the data on consumption and costs once a year when all invoices are available.

4.3.5. In hindsight: lessons learned & recommendations

The Municipality of Lana is very satisfied with the *Energy Report Online - ERO* project. In particular, better monitoring and support in the decision-making processes through the improved data situation is emphasized. In addition, the system was well received by the employees; it is lived and has contributed to the motivation and personal efforts to realize energy savings.

Lana recommends the ERO - or a comparable tool - to all municipalities and sees added value for companies and private individuals. However, the ERO is also still expandable:

- The energy report is used for internal and external communication. Still, citizens cannot currently view the ERO directly (because data can also be entered with each access).
- While the external consulting firm, the *Ökoinstitut Südtirol*, can view the data of several municipalities, Lana currently has no independent means of comparison with other municipalities.

External support plays a key role but also offers a great knowledge advantage by preparing the central results in an understandable form for the municipality’s political decision-makers, administrative staff and citizens.

WHAT CAN BE LEARNED?

- Better monitoring of energy consumption creates awareness and supports the decision-making processes.
- A standardized monitoring system that allows for inter-municipal comparison is advisable.

4.4. MAPPING THE CITY: KEŽMAROK'S GEO INFORMATION SYSTEM



Short Summary:

The City of Kežmarok has created a 2D and 3D geoinformation system that maps the entire above-ground and underground infrastructure. The information system includes GPS coordinates of all underground pipelines, fibre optic cables, buildings, roads, sidewalks, parks, individual trees, and other greenery. The availability and easy accessibility of the collected data allows the city to better plan its development activities, formulate public policies and communicate with the public about any interventions.

The overall goal of the City of Kežmarok to become a Smart Green City, conceptualised in the strategic plan *Idea Concept Smart Green City Kežmarok*, is being continuously realised through various projects and activities. All the work that has been done and the future strategies that have been adopted are aimed at the development of the entire city in order to achieve a higher quality of life for its inhabitants. The development and modernisation of the entire city in terms of infrastructure and processes bring with it the need to know the city, have all the city data readily available, and use this data to formulate and implement relevant public policies. The *GEO Information System* was designed to map the entire city.

4.4.1. Goals of the project

The *GEO Information System* aimed to create a 2D and 3D map of the entire city, including its surface and underground infrastructure. The intention is to make the system available to the public and, in more detail, to various professions. The City office is regularly inundated with requests from the public or companies for the location of underground networks. A fully mapped and updated information system with exact GPS coordinates makes this information easily available. Based on the authorisation of a particular profession of the

requesting person, the data can be accessed directly without the need to visit the city office. This saves office hours, time and personal expenses (Ručínská and Fečko, 2019).

4.4.2. Existing solutions considered by the municipality

In 2017, the city conducted a market survey for the supplier and three different companies were approached. The city aimed to find a supplier that would provide a complex solution for the city, including visualisation of the cadastre, spatial plan, engineering networks, institutions and other data based on digital maps of the city.

4.4.3. Implementation phase

The *GEO Information System* was implemented in several stages.

- In the first stage, server access was created, and the system was made available. Digital maps and databases were implemented and imported to allow the display of the base map, cadastral map and orthophoto map.
- In the second phase, the system was completed with engineering networks, passportisation of local roads, road signs, sidewalks, public lighting, car parks, bus stops, panoramic images, digitalisation of the spatial plan in raster format, and passportisation of trees and greenery. The supplier realised the main collection and processing of the data for the system in 2019 and 2020. In 2021 was the system supplemented by a high-resolution (0,025m/pixel) colour orthophoto map, vector spatial plan and tax analysis of buildings.

During the process of mapping trees and green areas, a city expert was involved who was able to carry out a dendrological survey.

The *GEO Information System* is continuously updated based on its connection to existing state registers. Also, when new information becomes available, the city employees update the data.

4.4.4. Project results

The *GEO Information System* is a full 2D and 3D city map with concrete locations and entered GPS coordinates. The mapped infrastructure includes buildings, roads, sidewalks, underground networks, fibre optic internet cables, trees, greenery, parks, and city surveillance cameras, but also the territorial plan of the city with parcels, land type, area in square metres, land use and property list.

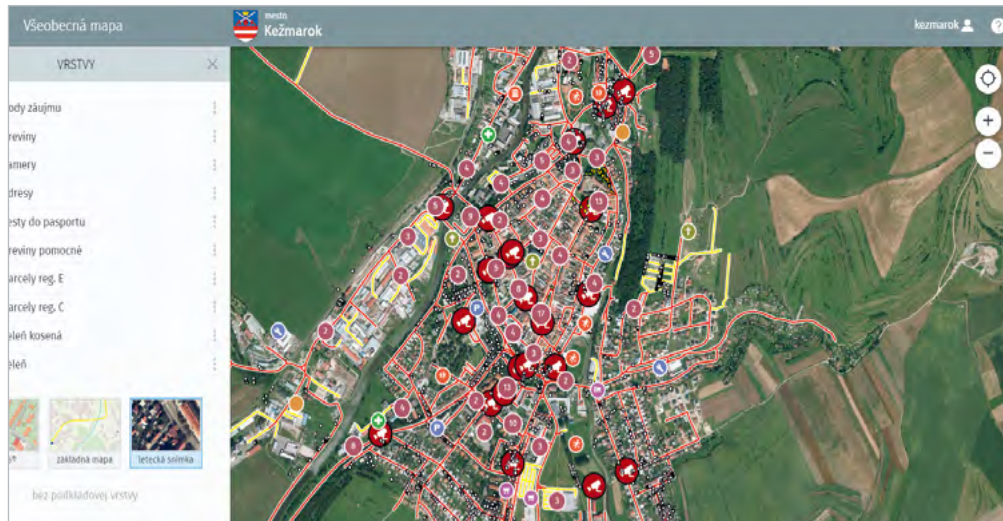


Figure 12: Kežmarok GEO Information system
 Source: Ferenčák (2021)

The mapped infrastructure and collected data are being actively used, or there is a plan for future use in different scenarios and by various authorities, people and the city itself.

Case scenario 1: Emergency accidents

Mapped lines under the surface provide insight into the city's underground.

In the event of an accident or damage to the lines, information about the area is always available.

Repair and intervention personnel can react immediately without having to wait for information about other lines, pipelines or cables in the affected area, preventing further damage.

Case scenario 2: Greenery and trees

The *GEO Information System* includes trees and other greenery in the city.

For each tree, several data are available, such as a specific ID, type of tree, Latin name for the tree, age, diameter, height, circumference of the tree.

In some cases, additional information is also collected and displayed, such as health status, growth quality, expected future development, planned pruning or felling, necessary interventions, etc.

The data available allows the city to plan its activities for each specific tree. This also helps the city to better formulate, implement and evaluate the public policy on green renewal and to communicate interventions to residents. Residents will be able to feel and know that any tree pruning has been carried out based on available data on the health of a specific tree.

Case scenario 3: Accessibility for professionals

The plan is that the *GEO Information System* will allow certain professions, such as architects or construction companies, to have much more direct access to data than the general public.

If a construction company is going to carry out work on-site, they will be able to have a closer look at the concrete area in advance to avoid any unwanted intervention or possible damage.

The availability of the data based on authorisation for certain persons will limit the need to request such information from the municipality, which saves administrative and bureaucratic official procedures.

4.4.5. Cost of implementation

The total cost of implementation was 76,500 Euro, and the estimated annual cost is 239 Euro.

4.4.6. In hindsight: lessons learned & recommendations

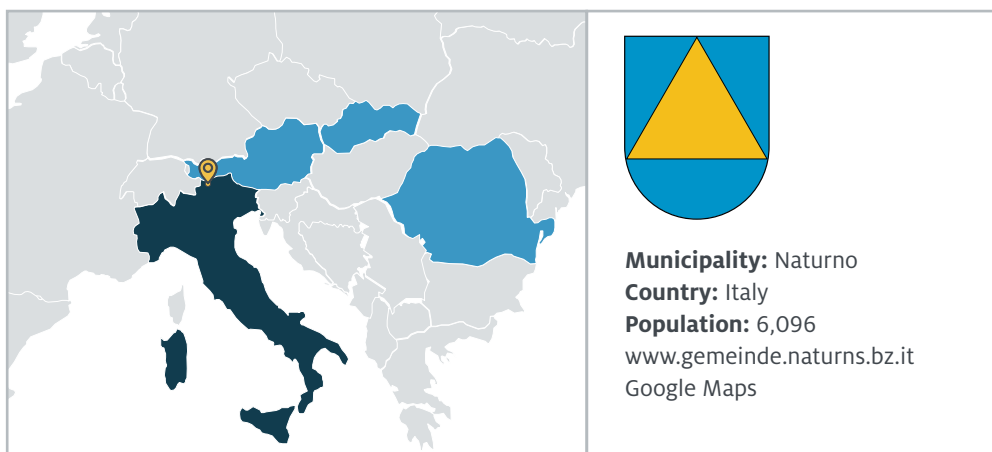
Mapping the city's entire above and below-ground infrastructure is not self-serving. The key is not just to have the data but to use the information available to formulate, implement and evaluate public policy. The city can better plan and time the reconstruction of roads or pavements, the renewal of greenery, repairs and restorations can be carried out much faster and with less unwanted intrusion. Overall, advance planning can be translated into budgeting to prepare the city's finances for upcoming investments. The end result is a better quality of life for residents.

The city sees opportunities for further development of the *GEO Information System*, such as autonomous full data availability for certain professions, which will be implemented in the future. Part of the available data will be used by the city exclusively. Other parts will be available to the public as open data. The city can use exact data in several ways, such as for property tax collection, as there is no doubt about the size of the property.

WHAT CAN BE LEARNED?

- Ease and convenience of data accessibility lead to effective self-government management.
- Information systems with automated data availability for authorized persons optimize city administrative activities and save office hours, personal and financial resources.
- Available and open data are used for better communicating public policies to the stakeholders and inhabitants.
- Collecting, managing and using city infrastructure data help formulate local public policies as evidence-based policymaking.

4.5. DIGITAL LINE MANAGEMENT OF THE MUNICIPALITY OF NATURNO



Short Summary:

Naturno developed a digital pipeline register to manage the municipality's water and wastewater pipeline network, the street lighting network, and the district heating and fibre optic networks.

The Municipality of Naturno is in the process of conducting a complete survey of the existing water and wastewater pipeline network and the street lighting network in the municipality area, including all connections, manholes, valves, etc. Data are already available for the district heating and fibre optic networks, which are also to be integrated. The new and existing data will then be presented digitally in a software solution to be developed during the project, thus enabling the creation and management of a digital pipeline register.

In a second step, it is planned to significantly optimize the costly, time-consuming and labour-intensive meter reading by using digital water meters to transmit the data to the municipality. For this purpose, the cadastral registration of the pipeline network is indispensable.

A user-friendly app will be developed to facilitate access to the digital pipeline register for citizens and technicians. It will also enable timely information retrieval for possible planning or maintenance measures.

4.5.1. Goals of the project

The Municipality of Naturno does not have a directory or plan for its pipeline network. Only the municipal building yard employees, especially the foreman, have this knowledge. Especially against the background of the upcoming retirement of the foreman, an externalization and writing down of this knowledge is immensely important.

Naturno has set itself the goal of surveying the entire pipeline network in the municipality and presenting it as a digital pipeline register. The municipality hopes this will provide optimized support for maintenance work, rapid detection of faults and damage, early identification of structural problems, and constantly updated data for all stakeholders. Digitization should not only relieve the burden on the municipality's building yard and reduce costs incurred by third parties but also significantly reduce administrative expenses.

The developed system will be made available to all municipalities in the province via the South Tyrolean Association of Municipalities so that they can also record their pipeline networks.

4.5.2. Existing solutions considered by the municipality

The South Tyrolean Association of Municipalities, which bundles IT solutions for the municipalities in the province, does not yet have a suitable software solution for managing a digital pipeline register. However, the new system to be developed should be compatible with the existing geoinformation system.

There are no open-source solutions for the planned app that could be adapted. However, the national electricity provider ENEL operates an app with a directory of power lines, which acts as a source of ideas.

4.5.3. Implementation phase

The implementation of the digital line management of the Municipality of Naturno takes place within the framework of the ERDF project *DigNaturno*. The European Regional Development Fund, ERDF for short, is one of the European structural and investment funds for implementing EU regional policy.

The project plan provides for external support and monitoring of the municipality:

- a consulting firm specializing in public subsidies supports the municipality in the project application, management, communication, and accounting;
- an engineering firm was commissioned to effectively digitize the infrastructure networks, i.e. to carry out the surveying work and collect the data with the subsequent presentation in a database.

Currently, the recording of the lines is in full swing. For this purpose, all manholes must be opened by the municipality's building yard employees, and the lines must be documented. This information is transmitted to the engineering firm and continuously digitized. The survey is very time-consuming. So far, about 1/3 of the approximately 2,000 manholes in the Municipality of Naturno have been checked.

4.5.4. Project results

The project is in full swing. The first data is promising and underlines the need for documentation and digital line management. The practical possibility of seeing where the lines are without having to send the foreman every time is a great added value.

On the other hand, the survey effort is tremendous, and it is not easy to find time because the building yard has a lot of work. One day a week is scheduled for two employees to open manholes and document the lines. The project was initially scheduled for completion at the end of 2022. Still, it is becoming apparent that a project extension will be necessary.

The software solution for the municipality's digital processing of the pipeline register and user-friendly access via app for all stakeholders (administration, citizens, technicians, etc.) will follow after the detailed data collection.

4.5.5. Cost of implementation

The total project amounts to about 306,000 Euro plus VAT. Of this, the *European Regional Development Fund* will support 85% (about 260,000 Euro). The remaining 46,000 Euro must be raised by the Municipality of Naturno.

However, the share of own funds is mainly labour or personnel costs of the existing employees of the municipality:

- In the survey phase, 2 employees of the building yard are planned for the line recording. The project plan foresees a workload of 416 hours or 0.26 FTE.
- In the administrative and operational project management, administrative employees of the municipality are scheduled with 976 hours or 0.61 FTE.

The following budgets are planned for external consulting and services:

- project management, communication and training of employees: 19,600 Euro;
- technical survey of the pipeline network, development of the software solution and app: 265,000 Euro.

The costs are offset by substantial savings that Naturno expects from the implementation of digital line management:

The municipal administration currently estimates the workload associated with the reading of water meters at 700 hours per year. With the digitalisation of the infrastructure network, the beneficiary expects an optimization concerning the maintenance work with a planned reduction of the workload of 266 hours per year, corresponding to a decrease of 38%. Furthermore, the project should help to quickly detect malfunctions and damages as well as structural problems and to keep the data always up to date. Digitization should not only relieve the burden on the municipality's building yard and reduce costs incurred by third parties but also significantly reduce administrative expenses. In addition, the project supports the population's involvement by guaranteeing citizens, companies and techni-

cians unrestricted access to current data at all times for any planning and maintenance measures.

4.5.6. In hindsight: lessons learned & recommendations

Even though the Digital Line Management project has not yet been fully implemented, Naturno is already seeing the first positive results. The practical possibility of seeing where the lines are without having to send the foreman every time is already a great added value. Naturno is convinced of the project's success and continues to work on it.

A key success factor that made the project possible in the first place is the funding from the European Regional Development Fund. The use of EU pots to subsidize innovative ideas and projects should generally be used more by municipalities. The bureaucratic effort for writing and submitting a project application and the project accounting is often a hurdle for municipalities. Naturno has shown that this hurdle can be overcome with the support of external consulting.

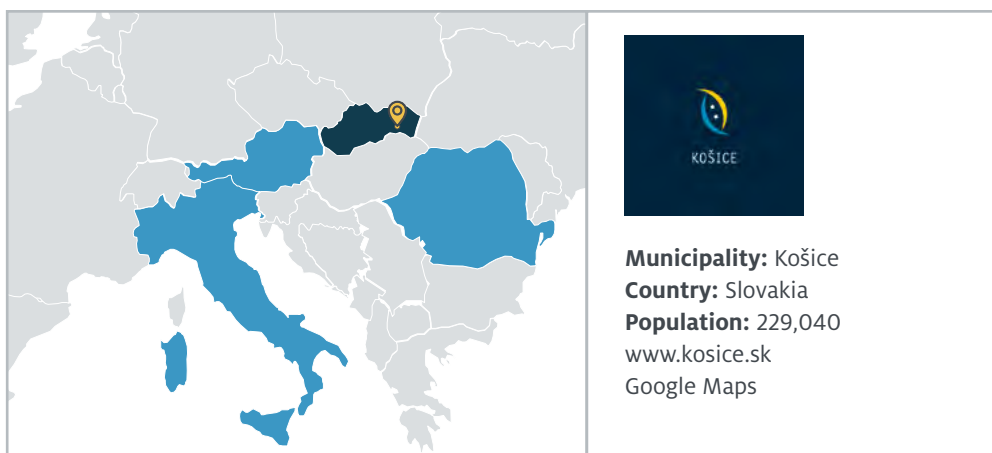
On the other hand, the workload for the actual survey was underestimated. Planning as precisely as possible is advisable for all projects. Still, it is not always easy, especially for such an exploratory survey of the pipeline network.

The software solution for the municipality's digital processing of the pipeline register and the app for all stakeholders will only be realized in the second project phase. However, it should be emphasized that this will be made available to all other municipalities in the province.

WHAT CAN BE LEARNED?

- A digital pipeline register to support the management of the municipality's infrastructure is beneficial.
- Knowledge should be externalized and documented, reducing the reliance on individual employees.
- EU funding is critical for (small) municipalities in the financing of such projects.

4.6. ADOPT A SIDEWALK IN THE CITY OF KOŠICE



Municipality: Košice
Country: Slovakia
Population: 229,040
www.kosice.sk
[Google Maps](#)

Short Summary:

The City of Košice has directly involved its residents in the winter maintenance of sidewalks, using the Adopt a Sidewalk principle. Each person involved is responsible for a specific section of sidewalk, maintains it during winter, and is financially rewarded for doing so. The city developed a smartphone app to manage the community of participating residents. It allows for sending notifications about the need for winter cleaning, sending images of the condition before and after cleaning, and providing an overview of the work done and the rewards awarded.

The winter maintenance in the Slovak Republic, especially the sidewalks within the municipalities and cities, was affected by the change of national legislation in 2018. Prior to the change in legislation, the winter maintenance of sidewalks in municipalities and cities was carried out by the residents living near the sidewalks. After the change in legislation, winter maintenance, which includes clearing sidewalks of snow and ice, was transferred to the owners of the sidewalks, which in the majority of cases, are municipalities and cities.

The City of Košice, the second largest city in the Slovak Republic, was also affected by the change in the approach to winter maintenance of sidewalks. In 2018, the city was responsible for maintaining 120 km of sidewalks. In 2019 the number increased to 232 km of sidewalks, and in 2020 the city's responsibility was extended to a total of 425 km of sidewalks. The increase in responsibilities in winter maintenance, which also led to an increase in financial demands, prompted the City of Košice to develop a solution using modern app-based technologies and the direct involvement of residents (Košice 2020b).

4.6.1. Goals of the project

The City of Košice aimed to cope with an increase in winter maintenance, which would have resulted in a much greater financial burden on the city budget. During the winter sea-

son, which lasts from 15 November to 31 March each year, the city involves its residents in the maintenance of sidewalks. The city focused on those parts of the city where sidewalks couldn't be accessed by winter maintenance vehicles and equipment and had to be shovelled and cleared of snow and ice by hand.

The involvement of residents in the cleaning of sidewalks and the adoption principle were chosen to increase the residents' responsibility for "their" sidewalk. If the community in a particular part of the city knows who is responsible for the sidewalk, it acts as a supervisor of the work carried out on site. The aim was to improve the overall quality of winter maintenance and the speed of intervention when necessary.

4.6.2. Existing solutions considered by the municipality

Similar solutions involving citizens in cleaning sidewalks have been implemented in other municipalities, but mostly in smaller towns and cities. The challenge for Košice was implementing a solution on a much larger scale, including digitalisation and using a smartphone app.

The smartphone app "Winter maintenance City of Košice" was developed as a unique pilot project for the City of Košice. The app was developed by Hotovo, a private company based in Košice. The City of Košice has already cooperated with this company in other IT areas.

4.6.3. Implementation phase

The City of Košice winter maintenance smartphone app was launched on 20 October 2020. It was fully available for IOS and Android users from the very beginning. The main development phase took three months and involved a total of seven employees of the private company.

Since its initial launch, version 1.0 of the app has been updated seven times, with the majority of updates focusing on bug fixes, text changes and general improvements to the interface and functionality of the app.

4.6.4. Project results

In the 2021/2022 winter season, a total of 710 sidewalk sections were made available through the app, of which 707 were successfully adopted for winter maintenance. The number of adopted sidewalks increased by 30% compared to the previous winter season.

The 2022/2023 winter season confirmed the interest of residents in the project. A total of 1,400 residents registered via the app to adopt one of the 832 pre-defined available sidewalk sections. In total, 759 sidewalks were adopted, and the city managed the rest.

The affected residents received two bags of gravel and salt from the council for winter maintenance. Any other equipment, such as snow shovels, had to be provided by the residents themselves.

Adopting a particular sidewalk via the City of Košice winter maintenance app involves several steps (Winter maintenance, 2023):

- download the app;
- register your account using your e-mail address;
- select and confirm a sidewalk from those made available;
- fill in your personal details, including the bank account number used for the financial reward;
- the app automatically generates an agreement;
- residents sign the agreement in person at the city office;
- the adoption is completed, and the resident is ready to receive winter maintenance notifications via the app.

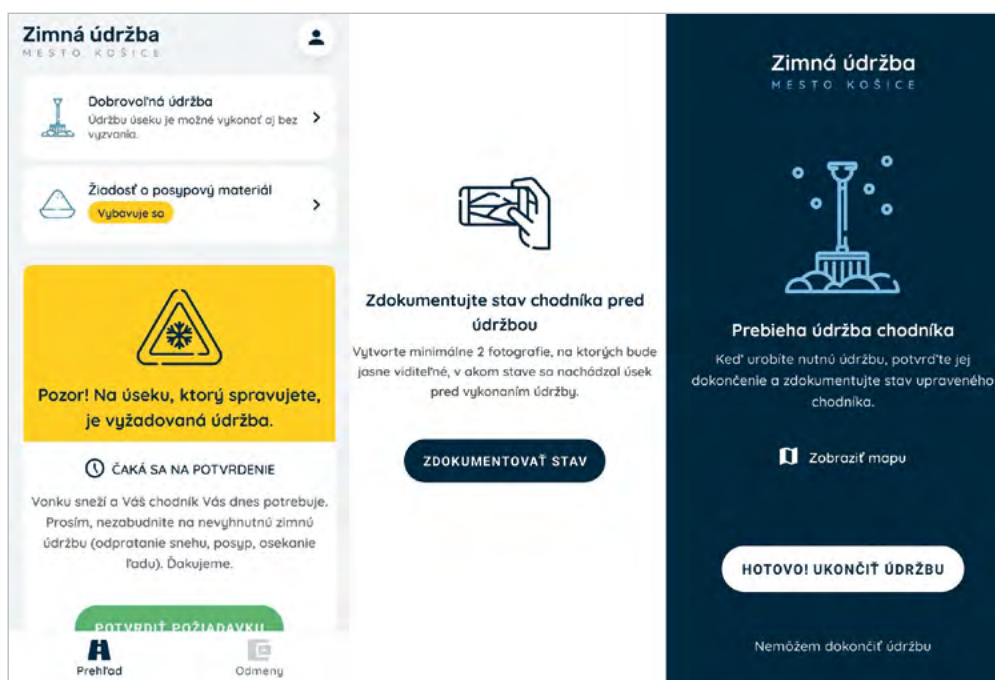


Figure 13: Notification of the need for maintenance
Source: App Winter maintenance City of Košice

Residents who have adopted a sidewalk are notified of the need for winter maintenance via the app. Once notified, the user has 4 hours to confirm the request. If the request is not confirmed, the city employee contacts the user/resident by phone to check if he/she is available for cleaning. The city can also cancel the contract with the resident if there have been several cases where the resident hasn't been available for cleaning.

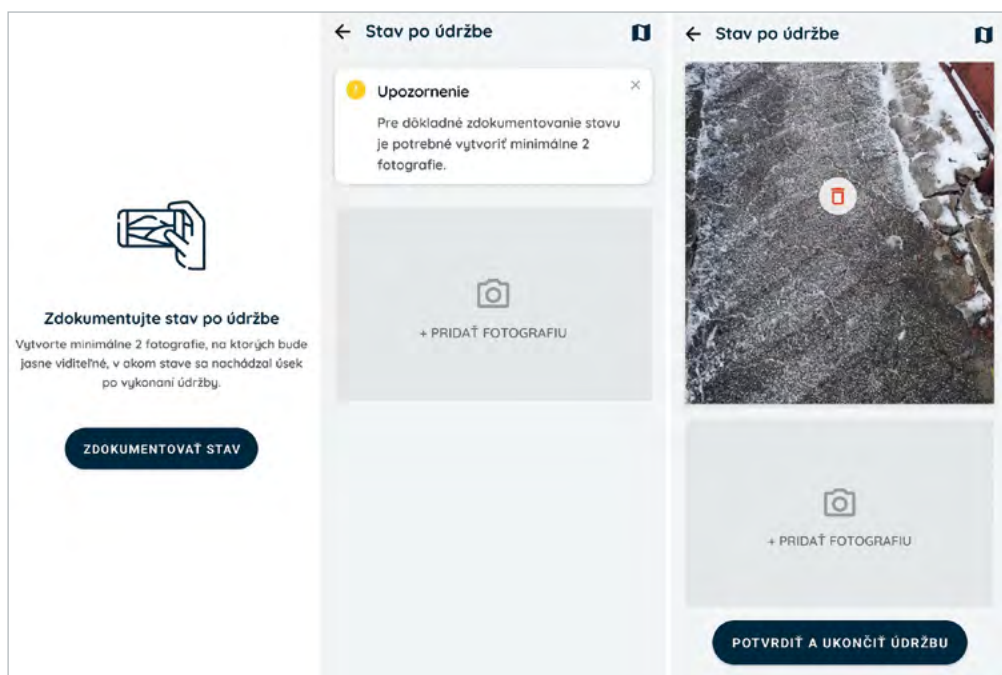


Figure 14: Report of the sidewalk maintenance
 Source: App *Winter maintenance City of Košice*

Before the maintenance work can start, the user must upload at least two photos of the sidewalk to the app. In the next step, the user carries out the winter maintenance. Once the work has been completed, the user confirms this via the app.

Once the winter maintenance has been completed, the user must take at least two pictures clearly showing the sidewalk and proving that the sidewalk is free of snow and ice. The user uploads the photos to the app and confirms the end of the winter maintenance operation.

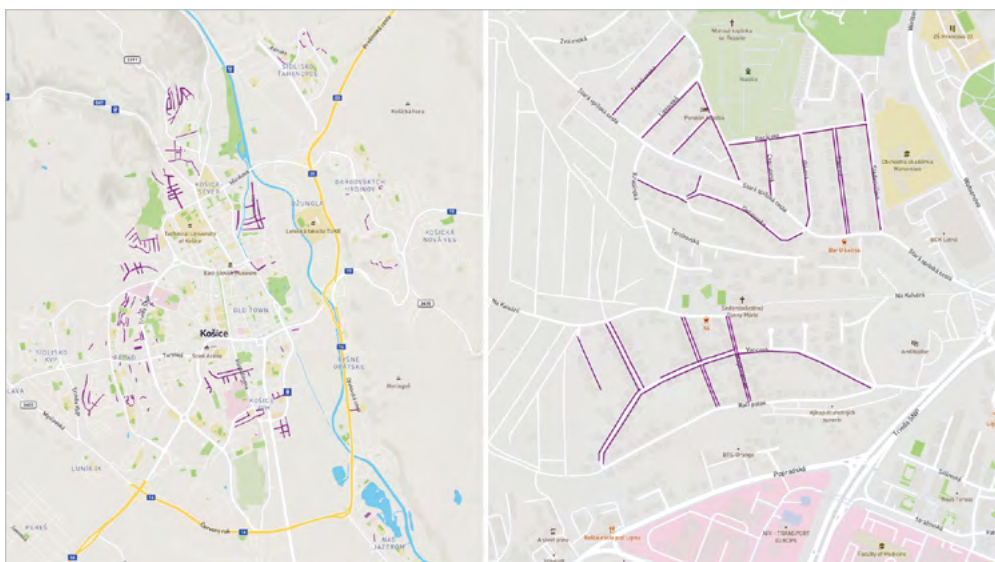


Figure 15: Adopted sidewalks map overview
 Source: *Adopt a Sidewalk portal (2023)*

Part of the digital management system for the project is a web portal that gives the city a clear overview of the adopted sidewalks. Each adopted sidewalk is visualised with additional information about the resident who adopted the sidewalk. Statistics can also be retrieved from the portal.

4.6.5. Cost of implementation

The cost of developing the “Winter maintenance City of Košice” app was 65,000 Euro. The city doesn’t expect any other major expenses related to the app, as all the know-how pertaining to the app has become the city’s property. Therefore, there won’t be any additional costs, such as monthly user fees.

The financial reward given to residents who take part in the sidewalk adoption project is made up of two components: a standby payment and a maintenance payment (Košice, 2020a):

The standby payment has been set as a lump sum of 200 Euro, which the resident receives as a reward for being on standby and ready to carry out winter maintenance if required. The standby payment is paid only once for the entire winter maintenance period.

The maintenance payment has been set at 5 Euro for each time the resident clears a sidewalk of snow and ice.

The total cost of the financial reward paid to residents who took part in the project for the 2022 winter season was 190,000 Euro. The city estimates that if the number of sidewalks

adopted by residents had to be maintained by the city's roads, streets and waste management company, the cost would have been at least three times higher (Košice, 2022).

4.6.6. In hindsight: lessons learned & recommendations

A unique solution, developed at the city's request, has enabled the city to manage the winter maintenance of sidewalks by involving the residents. A complex solution involving a smartphone app and a web portal contributes to effective direct management. Around 90% of all residents always respond on time, so the project is considered to be working.

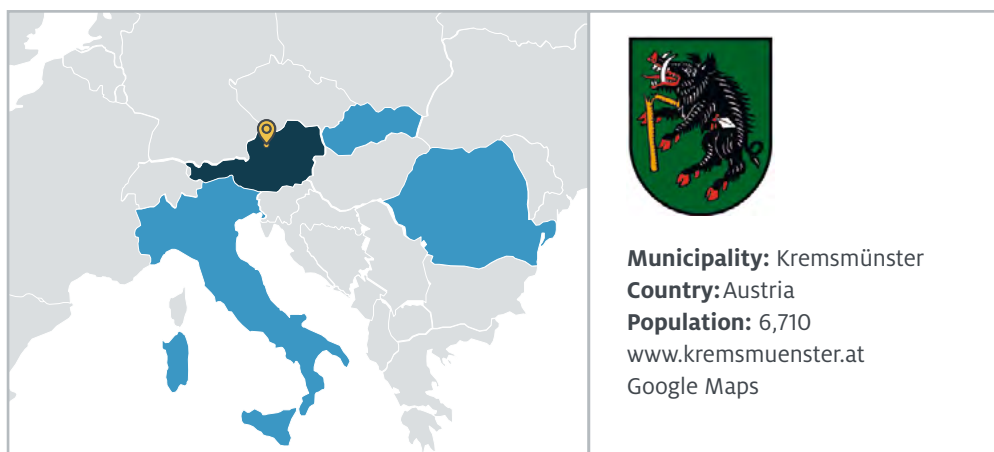
The challenge for the city is to ensure the sustainability of the app and the system as a whole. The company Hotovo has made several updates to the app, but these were within the warranty period. However, existing procurement procedures would require each development and future fixes to be procured separately.

The *Adopt a Sidewalk* project allows the city to respond immediately to winter maintenance needs, with hundreds of residents in different parts of the city cleaning their assigned sidewalks within 24 hours. This level of response wouldn't be possible with just any contractor. In this respect, any winter maintenance is better than none.

WHAT CAN BE LEARNED?

- Direct involvement of residents can lead to better public services.
- Direct involvement of residents can lead to more effective use of public financial resources.
- Residents involved in the city's public services are rewarded financially and feel more responsible for the area and environment in which they live.
- Using app-based technologies for smartphones helps to manage cooperation and communication between the city and the residents involved.

4.7. PROJECT ALEXA – A VOICE INPUT AND OUTPUT SYSTEM FOR THE CITIZENS OF KREMSMÜNSTER



Short Summary:

The Municipality of Kremsmünster developed a voice input and output system for the citizens of Kremsmünster to provide a service in addition to the citizen service in the town hall. This system was developed as a skill for Alexa and made available to the public for download.

The Municipality of Kremsmünster is generally very interested in digital solutions and e-government. It has already implemented and achieved a lot in this area. Accordingly, the mayor and the head of administration are interested in driving forward and implementing projects in this direction. In 2017, the head of administration of Kremsmünster had the idea of experimenting with a voice input/output system and seeing whether this could be interesting for public administrations and authorities and a step into the future.

The background is that voice input and output systems are becoming increasingly popular. On the one hand, because of the simple and fast application. On the other hand, the number of people who find reading and writing difficult is increasing.

4.7.1. Goals of the project

The idea was initially to develop a voice input and output system that would answer citizens' questions in front of the city hall. It should serve as a supplement service outside the opening hours of the personal citizen service in the city hall and as an additional service to the existing website and social media. The goal was not to replace the citizen service or individual workstations.

However, this idea could not be fully implemented, as individual findings contradicted it during project implementation. The project team, therefore, set itself the goal of program-

ming an Alexa skill and making it available to the public. A skill is a free app that all Alexa and Amazon users can download and thus add new functions. Skills are activated by a short word combination - in this case, the combination is: "Alexa, ask municipality Kremsmünster...".

4.7.2. Existing solutions considered by the municipality

There were various voice input/output systems during development (2017). Alexa was chosen at that time for several reasons:

- Alexa was more widespread than other voice input/output systems at the time;
- the system was probably the most mature at the time and worked the best;
- programming Alexa or a Skill is easier compared to other systems;
- the costs for the hardware are kept within manageable limits.

One major disadvantage of using Alexa was that it is a proprietary system. This means that only people with an Alexa or an Amazon account can access and use it. In the public sector, according to the head of administration of the Municipality of Kremsmünster, it usually is ensured that all citizens have access to and can use a service. In this case, an exception was made because the advantages of Alexa outweighed the disadvantages. In addition, the primary objective was to try out this system for use in public administration.

4.7.3. Implementation phase

The project implementation lasted 3 months. During the implementation phase, 3 students supported the head of administration:

- one e-business and marketing student was an intern in the city hall at the time of the project implementation and was responsible for the organization together with the head of administration;
- one student came from the field of software development and was thus responsible for programming;
- the third student studied media and communication at the time of the project and took care of the practical test and the correct questions.

Right at the beginning of the project implementation, the project team had to realize that the actual goal of setting up an Alexa in front of the city hall was not feasible. In practice, it became apparent that Alexa did not understand the dialect well enough. Furthermore, it needed a very clear pronunciation and was not flexible enough regarding the questions. The questions asked could not be answered correctly at that time.

As a result, the goal was to program a skill. To do this, the questions and the different ways of asking and phrasing them had to be precisely defined in advance. These FAQs were

collected from the citizens' service centre employees to cover the most common questions and topics. The result were 82 questions, each with several question variants, which were programmed as the "Municipality of Kremsmünster" skill. Instructions and help are available on Amazon's website³ for programming a skill.

In this project, the head of administration and the mayor decided not to involve the employees in the project idea and goals from the very beginning but to implement it technically and try out whether it could work at all. However, the municipal employees were involved before the skill was sent to Amazon for approval. The public was informed about the project and the result as well. It was also made clear immediately that it was not about replacing employees or that this is not even possible with this voice input/output system. All employees reacted positively and agreed with the publication.

Thus, the skill could be sent to Amazon for approval. It took only a few days until the release took place. From this point on, the skill was downloadable worldwide and could be used from home.

After the release, communication with citizens and the media took place. There were many interested parties, including the cities of Linz and Vienna. The Municipality of Kremsmünster provided information about the project and the results and gave some presentations to share their experiences.

4.7.4. Project results

There are no figures on the use of the skill after its publication. The head of administration estimates that it was/is used by at least 100 citizens of the municipality.

In addition, the skill was also downloaded by interested people from all over Austria to get an impression of how it works.

The Alexa itself was set up in the secretary's office of the town hall and can be used under supervision.

³ Amazon (2022): Alexa Skills Kit. Online: <https://developer.amazon.com/de-DE/alexa/alexa-skills-kit> (15.11.2022)



Figure 16: Alexa in the Municipality of Kremsmünster
Source: Municipality of Kremsmünster

No further development has taken place since the project was completed in 2017. The system would have to be adapted regularly, and the questions and answers would have to be renewed repeatedly to provide citizens with up-to-date information and a functioning system. The Municipality of Kremsmünster did not want to invest the necessary time and financial resources, as it was realized that speech input/output systems did not (yet) work well enough at that time to be usable as a supplement to the citizen service.

4.7.5. Cost of implementation

The costs of the implementation were manageable:

- the cost of the hardware was about 90 Euro;
- the students received a dinner and vouchers worth about 900 Euro in recognition of their work.

The personnel resources were covered as indicated below.

- The head of administration of the Municipality of Kremsmünster implemented the project during his working hours. He estimates a time expenditure of about 30 - 40 hours, which mainly went into coordination with the mayor and the students.
- The students contributed their time resources within the framework of their internship or the preparation of their final thesis.

4.7.6. In hindsight: lessons learned & recommendations

The head of administration of the Municipality of Kremsmünster is very satisfied with the project and the result. He emphasizes that a certain flexibility was crucial in this project and allowed them to adapt the project goals during the implementation.

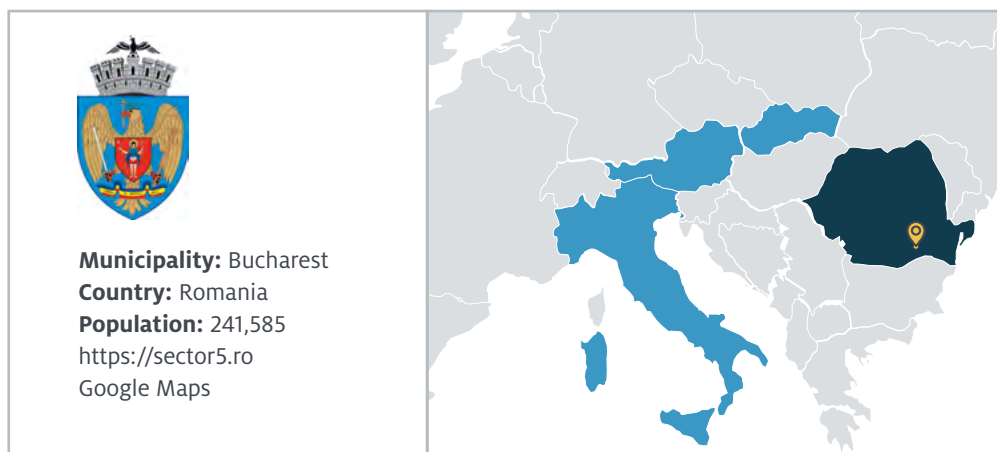
An important finding was that the speech input/output systems were not well enough developed at the time of the project (2017) to allow easy communication with citizens. In addition, the ongoing operation would be very cost-intensive, as the system would have to be adapted and maintained regularly. Current developments show that municipalities and cities are moving in the direction of chatbots, which function independently of the system. They are usually used via the keyboard and written text. There is currently no provision for a voice input/output function. According to the head of administration, using speech to obtain information is still an important topic in public administration, which should be taken up again. In addition, the speech input and output systems are now further developed. It would be very interesting for the Municipality of Kremsmünster to start a new attempt with other municipalities and/or cities to integrate a speech input/output system in chatbots or other open systems.

According to the head of administration of Kremsmünster, every municipality could develop or install a speech input/output system. In his opinion, it would be important that all other channels, such as the website or social media, are first kept up to date and used accordingly. Subsequently, thinking about a possible language input/output system is possible.

WHAT CAN BE LEARNED?

- In the future, speech input/output systems can supplement and expand communication with information for citizens in public administration.
- It is crucial for municipalities to use open systems that are available for use by all citizens.
- It would be helpful if several municipalities and/or cities cooperate for the development and work together on a new speech input/output solution.

4.8. A TOWN HALL CLOSER TO PEOPLE AT A CLICK AWAY, BUCHAREST, ROMANIA



Short Summary:

The project “A town hall closer to people at a click away” (<https://sector5.ro/o-primarie-mai-aproape-de-oameni-la-doar-un-click-distanta/>) improves the decision-making process, strategic planning and budget execution, as well as the quality and performance of the management of the Sector 5 Bucharest municipal government (<https://sector5.ro/>).

4.8.1. Goals of the project

Digital transformation is a process of growing interest for the local administration of Sector 5 of the Municipality of Bucharest, which has realised that it cannot be competitive in the absence of digitization and thus wanted to bring the municipal administration closer to the citizens in order to be more efficient and sustainable.

The general objective of the project is to improve the decision-making process, strategic planning and budget execution, and the quality and performance of the management of the Sector 5 Municipal government while also contributing to the creation of simplification measures for citizens following SCAP at the level of the Sector 5 municipal government.

To do so, the Sector 5 municipal government, as a beneficiary, in partnership with the *Association for the Implementation of Democracy*, implemented the project *A town hall closer to people just one click away* (code SIPOCA 661/code MySMIS 128825).

4.8.2. Existing solutions considered by the municipality

The project aims to develop an integrated IT system for interaction with citizens, comprising the following components:

1. Registration, online documents: The online access mode allows citizens, companies or other institutions to submit documents online to the institution's registry without going to the counter. Any documents can be submitted for automatic registration.

2. Development of parking lots via the online registry: This is a module for online access to the services for submitting documents to rent a parking space and integrating the online module with the module for managing and collecting parking contracts. The module allows users to:

- retrieve the file and automatically registering it in the registration flow;
- process it in the flow and resolve it at the end;
- generate the contract from the parking module by the inspector;
- electronically sign it and include it in the electronic file;
- return the resolution to the citizens and notify them of the decision by e-mail.

3. Inventory mode with barcodes: Printing labels for fixed assets and inventory objects with their identification data (name of the institution, barcode, inventory number, name of the heritage object), scanning of barcodes and carrying out the actual inventory of fixed assets and inventory objects including responsible persons and locations according to the situation in the field.

4. Management of public/private patrimony: Ensures the management of public and private patrimony assets in close relation with the financial accounting area (inventory number, depreciation), with the map (geographical positioning), with the electronic archive (access to scanned documents), with the taxes/fees (related to rental/concession contracts), providing technical data (surface, height, material, etc.), tools and information related to their management, concession and amortisation.

5. Interactive map module: Online map allowing users to access geographical information, displaying different types of information grouped in layers. It allows bi-directional integration with all other modules with address information (e.g. persons living at a given address, restitutions or expired authorisations, etc.).

6. The mode of authorization of commercial companies, commercial control and discipline in construction: Allows the management of the activities within the Department of Authorizations of Commercial Companies, Managerial Control and the Department of Construction Discipline, with the possibility of organising and following their workflows, generating automatic processing of documents specific to the department's activity and streamlining communication between departments through request modules.

7. Managerial Internal Control System Application: The application supports entities in all the integral stages of the Managerial Internal Control System: documentation, implementation, management, monitoring, reporting and updating. The application covers the five components of internal managerial control:

1. the control environment
2. performance and risk management
3. control activities
4. information and communication
5. evaluation and audit.

4.8.3. Implementation phase

The initial project implementation period was 26 months, from 19 June 2019 to 18 August 2021. Later, due to the pandemic, the implementation was extended until 18 August 2022 and subsequently until early 2023 due to post-pandemic challenges.

4.8.4. Project results

The integrated system for citizen interaction and data unification services, developed by the private service provider that won the tender, will soon be fully available. Specific modules of the system are already functional and tested.

The *Imagination and Civic Innovation Center* of Sector 5, developed with the help of the project partner - the Association for the Implementation of Democracy, is also fully operational.

The ten training sessions were completed, in which 150 people from the institution were trained in the mechanisms and standard procedures to support the actions targeted by the project.

A set of criteria was developed for prioritizing investments in the education, health, social assistance, and infrastructure (environment and transport) sectors.

In addition, a quality and performance management system (CAF) was implemented at the level of the City Hall of Sector 5 of the Municipality of Bucharest. The Institutional Strategic Plan adopted by the project was developed, and the Quality and Performance Management System ISO9001:2015 was implemented.

Through the implementation of the project activities, the following results could be achieved:

- Project result 1: Impact assessments for all regulatory administrative acts issued in 2019, after the project was contracted, and 2020 were prepared.
- Project result 2: Public policies that require financial resources from the institution's budgets for 2020-2021 have been elaborated.
- Project result 3: The ex-post analysis of the public policies/strategies/local council decisions developed/approved since 2016, embodied in a programmatic document “X-ray

of public policies/strategies/local council decisions developed/approved at the City Hall level sector 5 of the Bucharest municipality in the period 2016 - 2019” has been carried out.

- Project result 4: A set of criteria for prioritising investments in education, health, social welfare, and infrastructure (environment and transport) has been developed.
- Project result 5: An institutional strategic plan has been developed.
- Project result 6: ISO9001:2015 Quality and Performance Management System implemented at PS 5 level.
- Project result 7: “Innovation and civic imagination” centre was established and operationalised at PS 5 level.
- Project result 8: The CAF Quality and Performance Management System was implemented at the level of the City Hall of Sector 5 of the City of Bucharest.
- Project result 9: An IT system for process optimisation was developed and implemented at PS 5 level.
- Project result 10: 10 training sessions held with 150 people trained in standard mechanisms and procedures to support the actions targeted by the project, certified at the end of the participants’ quality.
- Project result 11: SCIM application developed and implemented at PS 5 level.

4.8.5. Cost of implementation

The project’s total value is 4,352,898.40 RON (approx. 870,579.6 Euro). Of which 3,436,600.48 RON (approx. 687,320 Euro) is non-refundable funding from the *European Social Fund* through the *Administrative Capacity Operational Program (POCA) 2014-2020*.

4.8.6. In hindsight: lessons learned & recommendations

The inclusivity:

One project activity involved establishing and operationalizing the *Center for Imagination and Civic Innovation* of Sector 5 to ensure direct and direct contact between the local public administration and citizens.

Designed as an interactive and innovative mechanism, the *Center for Imagination and Civic Innovation* of Sector 5 (CIIC S5) will be one of the main tools for the interaction between the community of Sector 5 and the local public administration through:

- providing feedback on public policy projects initiated by the local public administration of Sector 5;

- initiating and substantiating public policy projects beneficial to the community;
- participating in voluntary actions to support the activities of the municipal administration in emergency situations or in any other context in which the interests of the community are a priority.

Improving team skills

The project was written with the support of an external consultant after carefully analysing the existing situation and discussing it with the institution's decision-makers.

The institution's colleagues were involved and received the necessary training according to the specific requirements of their positions.

By the end of the project, almost all the proposed initial objectives had been achieved. However, one suggestion for a different implementation would be to allow a more extended period to analyse the goals and results.

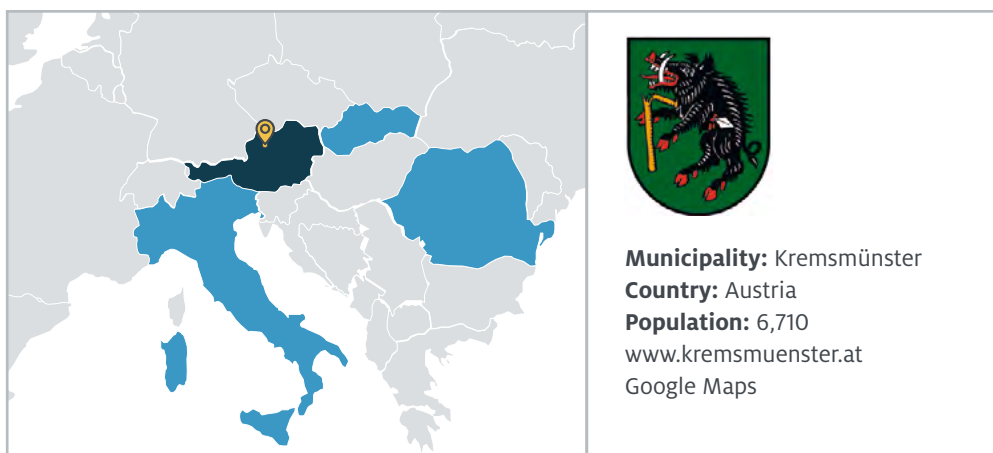
The project's general objective is to improve the decision-making process, strategic planning and budget execution, and the quality and performance of the Sector 5 City Hall management. At the same time, it contributes to the creation of simplification measures for citizens following SCAP. At the Sector 5 City Hall level, its most important result must be developing an integrated IT system for interaction with citizens and data unification services.

In future similar projects, developing the IT system for interaction with citizens should be a priority. This solution will increase digital development, and everything will be available in a web interface, accessible from anywhere, including mobile terminals.

WHAT CAN BE LEARNED?

- In future similar projects, creating an online platform and developing the IT system for interaction with citizens should be a priority because it will increase digital development, and everything will be available on a web interface, accessible from anywhere, including mobile terminals.
- Creating an app for an integrated managerial internal control may be very helpful as the success of SCIM app in this project has proven.
- Sometimes an unexpected external crisis (like the occurrence of the COVID-19 pandemic in the case of this project) may have a significant impact on achieving on time all the project results, hence for a better implementation a more extended time frame may be adequate for projects of similar complexity.

4.9. KREMSMÜNSTER'S ELECTRONIC OFFICIAL BOARD



Short Summary:

The electronic official board makes it possible to provide citizens with information about the municipality and ordinances in digital form. It is a touchscreen monitor installed near or inside the municipal office, replacing the display box. The unique feature of this official notice board is its legal conformity, which means it is no longer necessary to post ordinances in paper form.

Until the development of the electronic official board, citizens could obtain information on various topics in the municipality via the display boxes. Digital information systems were limited to the municipality website and an app until the electronic official board in Kremsmünster.

In addition, all official ordinances had to be posted for inspection for a certain period in order to become binding. This required the following steps:

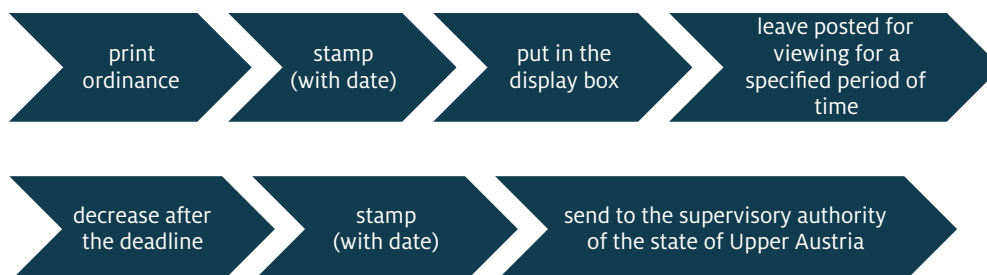


Figure 17: Process for posting official ordinances in Austrian municipalities
 Source: Own elaboration

In the Municipality of Kremsmünster, this affects more than 100 ordinances a year, according to the head of the administration.

4.9.1. Goals of the project

The project of the electronic official board aimed at making municipal information and ordinances visible on one screen. The decisive factor was, on the one hand, the integration and linking with the already existing website and app system. All channels (website, app and electronic official board) were to be served and provided with information simultaneously through a single system. On the other hand, achieving legal compliance in the publication of ordinances represented a key objective. This required the development of a digital time stamp.

The legally compliant electronic official board should reduce the time required to maintain the display cases and the process of announcing the ordinances. The citizens should also have access to current and more information 24 hours a day, 7 days a week, in front of the city hall.

4.9.2. Existing solutions considered by the municipality

When the Municipality of Kremsmünster came up with the idea of an electronic official board, Austria had no comparable system. There were already digital screens as a source of information for citizens, but not yet the link with existing systems. This was the decisive reason it was decided to develop a specific electronic official board, which could be integrated into the existing software.

The head of the Municipality of Kremsmünster won the two companies, RIS and GEMDAT, which already offer digital solutions at the municipal level, as project partners. Together they started the development of the electronic official board under the condition of integration into the existing system.

4.9.3. Implementation phase

It all started with the idea and the formulation of the goal. Those involved in the project considered what was needed in their community. In addition to the head of the Municipality of Kremsmünster, employees of the following companies were involved:

- *RIS GmbH* - supports, among others, 1,300 municipalities and cities in Austria, South Tyrol and Germany with municipal software solutions such as GEM2GO WEB or GEM2GO APP.
- *GEMDAT OÖ GmbH & Co KG* - offers software, hardware, seminars and support for municipalities, for example, in financial management or construction administration.

After the project idea had been defined, the municipal employees were informed about it. Since the benefits for the employees were primarily time savings and reduced workload, the project was very well received.

The costs were estimated in advance at 3,000 - 5,000 Euro.

The idea was then implemented in two steps and took about 6 months:

— **Step 1: Development of the electronic official board**

The first step was to develop the electronic official board as an additional source of information for citizens in front of the municipal office, which was to replace the conventional display case. The challenge was integrating it into the existing system so that the website, the app and the official board could be managed and fed with information via a single, existing tool.

— **Step 2: Obtaining legal compliance**

In the second step, the focus was on achieving legal conformity so that the announcement and approval by the supervisory authority could be processed in digital form.

The challenge in this project was that the development had both technical and legal factors. Therefore, the head of the administration of the Municipality of Kremsmünster took a very close look at the legal basis in advance. Back then – also on the initiative of Kremsmünster – the law was changed to allow the use of electronic official boards. Contact was made with the relevant authorities by those involved in the project. However, the province of Upper Austria did not assure legal conformity in advance but wanted to check this based on a practical example.

According to the head of administration, programming and integrating the time stamp into the existing system presented a significant challenge in project implementation. It took a while before it actually worked in practice.

Now the verification by the supervisory authority still had to take place. The Municipality of Kremsmünster sent the first digitally announced ordinance with the digital time stamps as a PDF document to the supervisory authority for review. The supervisory authority approved this, thus granting the system legal compliance status.

After the completion and installation of the electronic official board, all three resident pensioners' associations were invited and explained and shown how to operate it on-site using the digital screen.

4.9.4. Project results

The legally compliant electronic office board was put into operation on December 2, 2019. According to the head of the administration, the electronic official board is used more frequently by citizens than the display cases were used as a source of information. Now, much more content is accessible. For example, users can view photos of recent events or read the municipal newspaper. The following photos show electronic official boards in different Austrian municipalities:

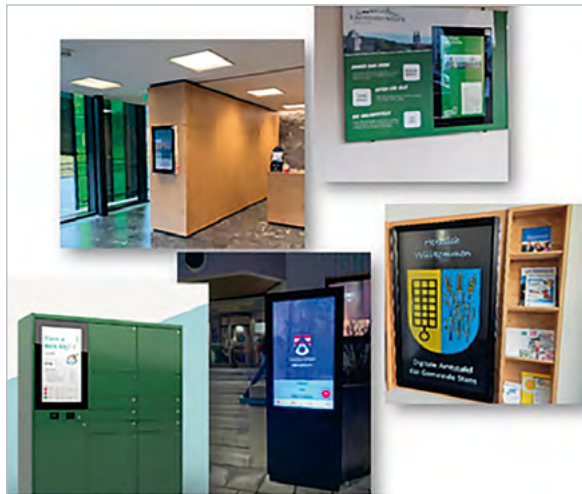


Figure 18: Electronic official boards in different Austrian municipalities

The current ordinances are available for review on the electronic official board and on the website at https://www.kremsmuenster.at/Gemeinde_Service/Amtstafel.

A digitally signed and stamped ordinance looks like this:

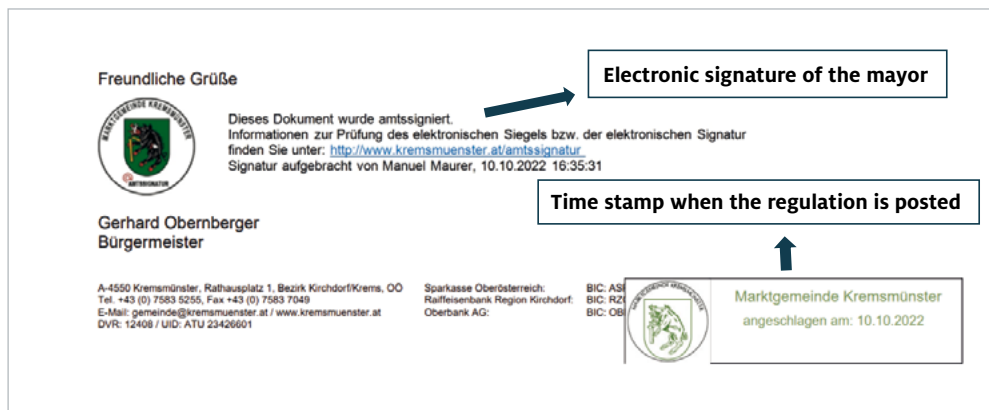


Figure 19: Example of a digitally signed and stamped ordinance

Source: Own elaboration

After the time for posting an ordinance has expired, municipal employees send the automatically double-stamped ordinance in digital form to the regulatory authority.

In the months following implementation, adaptations still had to be made. For example, the power failure problem was subsequently solved by automatically extending the announcement duration.

Currently, the legally compliant digital official board primarily represents a time-saving for municipal employees.

For the participating companies, RIS and GEMDAT, the legally compliant electronic notice board is an extension of their software range. It has been included in their product portfolio. The system can be purchased by municipalities and cities through the two companies. Approximately 1,200 municipalities in Austria use RIS-Kommunal, the municipal software package for municipalities. According to the head of administration of the municipality, hundreds of municipalities are already using the electronic official board GEM2GO KIOSK⁴.

4.9.5. Cost of implementation

The following time resources were invested in the development of the legally compliant electronic notice board:

- The head of the Municipality of Kremsmünster invested about 30 - 40 hours in the project, which he performed during his regular working hours. This mainly included meetings with the project partners for the development and the responsible persons of the Upper Austrian state for obtaining legal conformity.
- Within the municipality, the mayor and two employees were involved in the project. They were available to the head of the municipality for exchange and decision-making and were regularly informed about the project status.
- The programming and development of the software were carried out by the two companies involved, RIS and GEMDAT, which meant that there were no costs for the municipality. The benefit for the two companies was that they could subsequently include the developed legally compliant electronic official board as a product in their range of services for municipalities.

The cost of the display was approximately 3,000 Euro. This is actually an indoor screen mounted outside under a roof. The disadvantage is that these screens are less robust and safe than outdoor ones. However, an outdoor screen would have cost about 10,000 Euro.

Municipalities pay a monthly fee for using the electronic official board, which can vary depending on the software package. Detailed information about the costs can be obtained from the providers.⁵

⁴ GEM2GO KIOSK: Ihre Gemeinde – Ihre Digitale Amtstafel. URL: <https://www.gem2go.info/kiosk> (21.10.2022)

⁵ GEM2GO KIOSK: Kontakt. URL: <https://www.gem2go.info/KIOSK/Anfrage> (21.10.2022)

4.9.6. In hindsight: lessons learned & recommendations

The Municipality of Kremsmünster is very satisfied with its approach and the final product of the legally compliant electronic official board. It would follow the same path again in the future. The challenging legal aspects and the integration into the existing system were also solved.

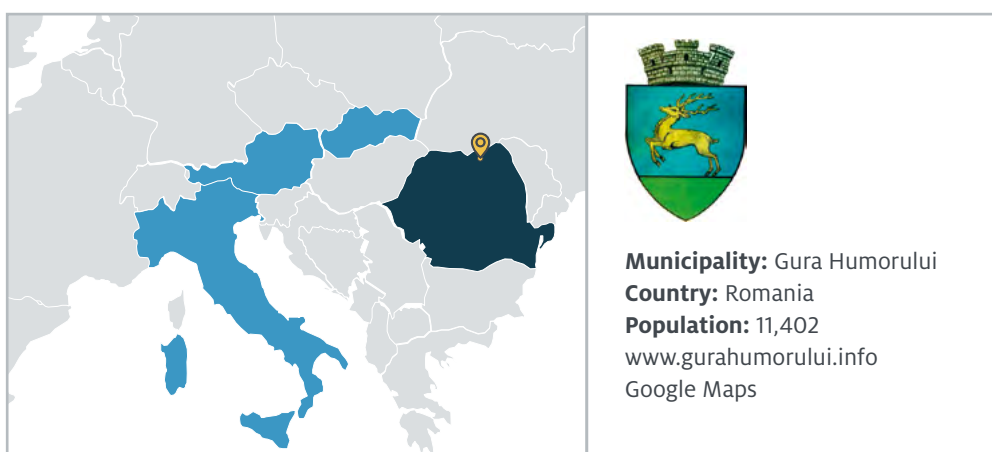
The head of the administration describes the screen selection as challenging, as there are significant price differences between the indoor and outdoor variants. After three years, the municipality is still very satisfied with their choice of an indoor screen in the covered outdoor area.

The head of administration recommends integrating the digital systems into the daily work routine and involving all municipal employees so that the website and information can be kept up to date.

WHAT CAN BE LEARNED?

- The electronic official board is a valuable tool for municipalities that offers citizens additional information and a user-friendly application through a touchscreen monitor.
- For municipal employees, the legally compliant digital posting of ordinances with the digital time stamp saves time in their daily work.
- The electronic notice board developed by Kremsmünster is available for sale from the companies involved. It is already being used by many other municipalities in Austria.
- It must be integrated into already existing software and systems within the municipality.

4.10. GURA HUMORULUI: IMPLEMENTING A VIDEO MONITORING SYSTEM TO INCREASE SAFETY AND PREVENT CRIME



Short Summary:

The Municipality of Gura Humorului provided an optimal tool for video-supervising the key areas in town. It improved public safety and solved the issue of environmental preservation and traffic flow through a better monitoring system.

Gura Humorului is a small town in Suceava county, in the northeastern part of Romania, in the historical province of Moldavia and the southern part of Bukovina. On 1 March 2005, Gura Humorului was declared a tourist resort of national interest. The town is situated on the eastern edge of the Obicinele Bucovinei mountains, in Humorului Depression, at the confluence of the Moldova and Humor rivers. The average altitude of the town is 470 metres.

As of January 2022, about 15,300 people live in Gura-Humorului, representing about 5% of the urban population of Suceava county. The town covers an area of about 60.9 km², with a total surface of 6,984 ha.

The main objectives of the sustainable development of the City of Gura Humorului are defined in the Integrated Strategy for Urban Development. The strategy is the guiding framework for the development of project-based programmes with three components, such as “Gura Humorului - Tourist Resort”, “Gura Humorului - My Home”, and “Gura Humorului - Green City”. The Integrated Strategy for Urban Development (ISUD) is implemented through the National Plan for Local Development. The municipal administration is divided into different departments, representing the responsibilities of the city. For example, there are departments for construction and infrastructure, citizen services and financial matters. Approximately 171 people work for Gura-Humorului City Hall.

The use of digital tools and services is a constant concern at the level of public administration in Gura Humorului. This is reflected in the Integrated Urban Development Plan and the Sustainable Development Strategy of Gura Humorului.

Some important projects that can be mentioned as successful are: *Ghiseul.ro*, *WiFi4EU* and *CityApp*.

An important project in terms of public safety in Gura Humorului is the use of digital tools for the permanent video surveillance of the most critical areas, such as the Arinis Dendrological Park, crossroads and cultural and social points of interest. The project's name is: Implementing a video monitoring system to increase safety and prevent crime in Gura Humorului using the European Regional Development Fund.

Gura Humorului is permanently monitored with 48 video cameras dispatched from a video monitoring centre. The project was financed by the *Regional Operational Program 2007-2013*, Priority Axis 1 - Supporting the sustainable development of cities - urban growth poles, Intervention Area 1.1 - Integrated urban development plans, Sub-area: Urban Centers.

The project was launched in April 2011 with the direct support of the Minister of Regional Development and Tourism to improve public safety through concrete measures.

The city's sustainable development aims at the permanent improvement of the city's appearance as a strategic method of attracting new tourists and creating safe and modern leisure facilities. Modernizing public safety services and implementing surveillance systems in public spaces are part of the Local Development Strategy promoted by the municipal administration, with an implementation period from 2011 to 2020.

Before this video surveillance project was implemented, the settlement time for accidents in the area was much longer, based on written statements and eyewitnesses who could subjectively report the event.

4.10.1. Goals of the project

The 2 main objectives of the project are:

- permanent video surveillance of the main areas of the city;
- to create a digital monitoring platform to reduce car accidents and criminal activities as well as increase environmental protection (to identify and punish persons or economic agents who pollute the environment through unauthorised disposal of household/industrial waste).

The dispatcher monitors and manages the video equipment and is intended to be a tool for early intervention. Its main benefits are prevention and rapid, on-the-spot intervention in real-time. The mayor said that the dispatcher would ensure immediate intervention so that citizens would no longer have to call 112 when they notice a violation of the law.

Specific objectives:

- video monitoring of public areas to prevent and detect possible crimes;
- planning and computerised management of resources;
- recording and statistical analysis of events and the use of resources;
- discouraging the phenomenon of crime and improving the level of social safety and security of citizens and tourists.

4.10.2. Existing solutions considered by the municipality

The local administration organised several public consultations with citizens, and the issue of public safety was constantly raised. The following needs were identified: more efficient surveillance of public spaces managed by the municipality; reduction of material damage; reduction of fuel consumption for operational intervention teams (local police, fire brigade, ambulance services); more efficient use of staff serving the population.

The proposal to write a project and apply for EU funding was the right decision. The monitoring system should gradually increase public safety. This digital solution also allowed for a comfort upgrade in some critical areas of the city, giving citizens the feeling of a safe urban space.

In addition, public administration scored higher due to the project's implementation. The leading public authorities providing services for citizens' safety reduced public expenditure and saved time in solving cases.

4.10.3. Implementation phase

The project followed the standard procedure for the implementation of a European-funded programme:

- project idea: the current mayor's management plan is proposed at the beginning of his term of office, and then submitted to the city council for approval by vote;
- feasibility study;
- consultancy firm (project preparation and project management);
- the signing of the contract with the funding authority;
- public tender for the purchase of digital equipment;
- installation of digital equipment.

During the feasibility study phase, the following needs were identified: increased public safety, especially in areas with reduced visibility (parks, squares and markets, the city's recreational area and major intersections), increased flow of tourists passing through the area or staying for a limited period, contributing to a higher frequency of potential road incidents, and increased acts of vandalism/destruction in public areas of the city.

At the administrative level, the following needs were identified: more efficient surveillance of public spaces managed by the municipality, reduction of material damage, reduction of fuel consumption of operational intervention teams (local police, gendarmerie), more efficient use of staff serving the population and paid from the state budget.

The project was carried out with the help of a consultancy firm. It involved signing a contract with the funding authority, followed by the public tender stage for purchasing the digital equipment and its installation by a specialist (contracted) firm.

The grant application was submitted on 02.09.2010. The funding contract was signed on 16.04.2011, and the implementation period was 19 months with a one-month extension.

4.10.4. Project results

The dispatcher, which monitors and manages video devices, aims to serve as a timely intervention tool - its primary utility is prevention and rapid, real-time, on-site intervention.

There has been an improvement in the work of all the structures responsible for protecting citizens and public property (Police and Gendarmerie). Efficiency and speed gains in the resolution of reports made, taking into account the loss of some senior posts in the staffing of these institutions, have been observed.

At the same time, as long as lawbreakers are caught in the act, the time taken to investigate a crime and the cost of investigating and resolving cases is significantly reduced. This has positively impacted public safety in a tourist destination of national interest that has grown in popularity in recent years.

Another critical aspect of the project is preventing corruption among traffic police officers.

There has been a massive reduction in crime and vandalism. There has also been a steady decrease in the number of cases of environmental pollution.

4.10.5. Cost of implementation

The project's total value was 2,798,909.52 lei (Romanian currency), equivalent to 676,604.42 Euro.

The co-financing of the beneficiary (Gura Humorului) amounts to 56,156.72 lei (Romanian currency), equivalent to 49,403.2 Euro.

Non-refundable resources: 274,275,280 lei, equivalent to 66,330 Euro.

The staff involved in the project implementation consisted of four members from Gura Humorului's administration.

4.10.6. In hindsight: lessons learned & recommendations

The project has been successful because it has led to a long-term reduction in robberies and street and public property misbehaviour.

The monitoring activity identified another need and led to the formulation of another project proposal: the city ring road construction. The traffic study led to the green bus project. The school transport started using electric buses. In that sense, the good practice example demonstrated the need to implement spin-off projects to solve problematic issues in developing the local, sustainable economy.

Subsequently, other municipalities of Suceava county applied for funding and implemented similar projects, following the Gura-Humorului model. Ipotești and Câmpulung Moldovenesc are two of them.

During the implementation phase, the project faced some difficulties, such as the tendering process, which led to delays and amendments to the original budget, increasing it by around 40%. The Municipality of Gura Humorului had to finance these ineligible costs from external sources.

WHAT CAN BE LEARNED?

- Good knowledge of project environment is crucial for planning properly. Always take into consideration the changes that might occur during the project implementation (political, economic, legislative etc.), inside and outside the country.
- Good video monitoring leads to a decrease in crime and vandalisms and the costs of combating them.
- A good project can generate ideas for other projects and can be applied in other municipalities, as is the case of the video monitoring system.

4.11. CITY POLICE MSP SOS SECURITY APP IN THE CITY OF KEŽMAROK



Short Summary:

The City of Kežmarok, in close cooperation with a private company, has developed the MSP SOS mobile phone security application to increase the safety of its residents. The MSP SOS is connected to the camera surveillance infrastructure of the City Police. It combines modern information and communication technologies with City Police interventions.

In the city's strategic document, the *Program of Economic and Social Development of the City Kežmarok 2014 – 2020*, the city has devoted one of its main goals to the security issue in order to achieve a safe town and to increase the security of the inhabitants and tourists visiting the city. This strategic goal has been specified within three strategic measures focusing on prevention, preparedness for extraordinary events and adaptation to climate change. Particularly in the area of prevention, the role of the City Police is crucial.

The Kežmarok City Police was established more than 30 years ago, on the 25th of June 1991. In 2021 the Kežmarok City Police had a total of 18 police officers. In 2021, the Kežmarok City Police used a total of 37 camera systems with 83 different views based on and using smart technologies (Kežmarok, 2022d). The MSP SOS app brought the integration and cooperation of the existing human and technological infrastructure of the City Police with an easy-to-use smartphone application for the city's residents.

4.11.1. Goals of the project

The main goal of developing and operating the MSP SOS App was to create an environment in the city where residents could feel safe and comfortable. The City of Kežmarok was the first city in the Slovak Republic to provide its citizens with such a security service application. This means the application was developed as a unique project for the City of Kežmarok (Rozgonyiová, 2021).

4.11.2. Existing solutions considered by the municipality

The MSP SOS App was developed as a pilot project specifically for Kežmarok. Overall, the app was introduced and developed as part of a complex security system in the city, including surveillance cameras, a security operations centre operated by the city and the City Police directly present on the city's territory.

4.11.3. Implementation phase

The MSP SOS app was developed by the Slovak private company TSS Group. The initial preparation phase lasted two months. Overall, the city perceives and understands the app as part of the city's security system, which is still in the process of being completed. Further development will include increasing the number of surveillance cameras in the city to cover a larger area and extend the security system to the entire city.

4.11.4. Project results

The MSP SOS App provides its services free of charge and based on an initial registration by the user. The user enters their first name, last name, and telephone number during the initial registration process. After registration, the user receives a verification code to validate the registration process. The application is supported across different mobile operating systems and requires mobile data or Wi-Fi Internet access. The purpose of registration is to restrict use to the intended area and users. The service provider can also block the user in case of potential misuse.

After successful registration, the App offers three main services: *SOS alert*, *Feeling distressed* and *Create a report*.

SOS alert

- When the SOS button is pressed, a signal is immediately sent to the City Police along with the user's registration details.
- If the user is within range, a security camera will automatically detect the user based on their location and follow them.
- The City Police Operations Officer assesses the situation based on the observation and calls for the assistance of the City Police patrol on site or decides that there is no danger.

Feeling distressed

- The button is used when there is no immediate danger to the user, but the user feels they may be in danger.
- If within range, a security camera will automatically detect the user based on their location and track their movements for one minute.

Create a report

- This button can be used to report a traffic incident, fire, riot or vandalism to the City Police.
- It is also possible to create a custom report using your own text if the report doesn't fit into any of the above cases.

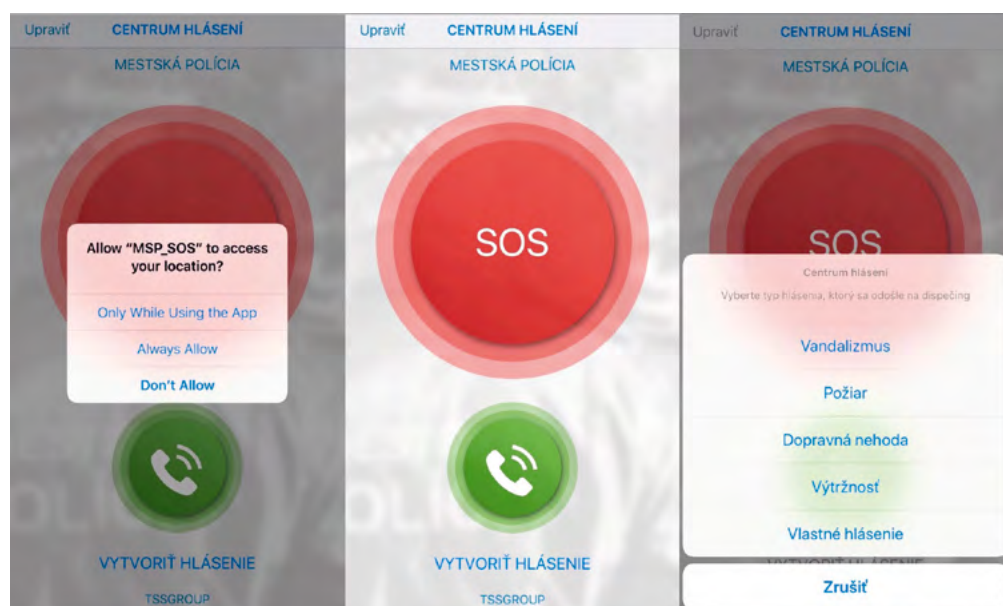


Figure 20: MSP SOS App used in the City of Kežmarok
 Source: Ručinská and Fečko (2019)

4.11.5. Cost of implementation

The initial cost of developing the MSP SOS app by the private company was 3,000 Euro. As the app was a specific pilot project for the city, there were no additional operating costs for the city.

4.11.6. In hindsight: lessons learned & recommendations

The MSP SOS app has been downloaded by approximately 300 residents of Kežmarok. The city sees this number of users as a starting point, as the development of the city's overall security system will eventually increase the number of users.

The MSP SOS app has been used by users several times, but mainly to create a report, e.g. about improperly parked cars or waste problems in the city. The city sees the safety

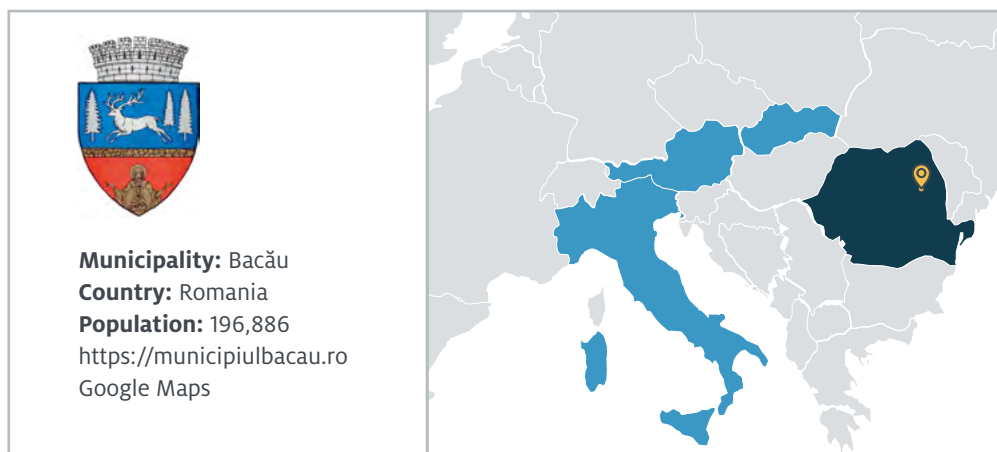
alert aspect as positive, as the aim was to introduce such an app as a preventive measure. Residents can feel safer just by knowing that such a system exists, is run by the city, and is connected to the City Police.

The city's overall security system and the MSP SOS app will be further developed by incorporating public lighting. Each public/street light in the city will be rebuilt as a separate control point. This will allow each light to be controlled individually. As a result, the security system will work in such a way that the MSP SOS App will be used if a resident is in danger. When an alarm is triggered, the camera system automatically tracks the person and informs the surveillance centre. Additionally, the public lights closest to the person will increase their intensity.

WHAT CAN BE LEARNED?

- Integration of city police and camera surveillance infrastructure with modern AI-based applications.
- Cooperation of the city with private sector developers to create a unique solution for the city.
- Complementing autonomous ICT-based and human-operated systems.
- Developing a complex city security system.

4.12. A PLATFORM FOR ADMINISTRATIVE SIMPLIFICATION AND BETTER SERVICES IN BACĂU



Short Summary:

The Municipality of Bacău has launched a project to implement innovative digital systems to simplify the delivery of services to citizens and to digitise the municipal archive.

Since implementing the Digitalisation Strategy in 2017, the Municipality of Bacău has undertaken a significant digitalisation process. In the last two years, it has implemented two major projects:

- the integrated informatics system for the management of interaction with citizens and the management of incidents affecting the public domain of Bacău (CIC);
- the informatics platform, with back-office and front-office components, for administrative simplification and optimizing service delivery for the citizens of Bacău (SIPOCA 571).

SIPOCA 571 is a project co-financed by the *European Social Fund (ESF)* through the *Administrative Capacity Operational Program 2014-2020*. The contract was signed on 10 December 2018 with an implementation period of 27 months.

Through these projects, the Municipality of Bacău aimed to optimise the work of public servants by implementing an integrated management platform for activities and records, including the digitalisation and electronic management of the municipal archive. It also aimed to implement a portal for the online delivery of services to citizens and to improve civil servants' digital skills in using IT systems and managing e-documents.

The Municipality of Bacău plans to extend the digitalisation of the back and front office activities of the Directorate of Social Assistance Bacău, the Local Police and the Directorate

for Heritage. To this end, Bacău has launched the “SIASCoP Bacău -Informatics system of service automation with shared competencies” project.

4.12.1. Goals of the project

The project’s goal was to improve the administrative efficiency of Bacău by implementing innovative digital systems to simplify the delivery of services to citizens and businesses. It also aimed to include the digitalisation of the municipal archive and meet the specific objectives of the *Administrative Capacity Operational Program (ACOP)*.

Specific objectives:

- optimisation of the work of public servants through implementing an integrated management and recording platform, including the digitalisation of the municipal archives;
- implementing a digital platform for citizen services;
- improving the digital skills and knowledge of civil servants in the use of ICT technologies and the management of e-documents.

4.12.2. Existing solutions considered by the municipality

After completing the Digitalisation Strategy, the experts of the Municipality of Bacău identified the ICT solutions that would meet the needs of the citizens, namely to use the web to interact with the authorities, to save time and other resources, to resolve their requests in a timely manner, and to improve access to public services.

The administration also aimed to make service delivery more efficient, save resources, improve access to the archive and have better query tools. It also needed to improve parking management and labour productivity, reduce bureaucracy, provide quick resolution of enquiries, access to e-government tools and easy parking.

4.12.3. Implementation phase

The project team comprised five members (a project manager, an assistant manager, a financial specialist, an acquisition specialist and an ITC specialist). The project activities were targeted at a group of 40 employees of the City Hall, namely the staff that would use/ manage the project results.

The project team organised consultations and meetings with the representatives of the directorates within the City Hall and the other stakeholders (citizens and businesses).

Five external suppliers of goods and services were used during the implementation phase:

- analysis services of the current processes and documentation of functional requirements for electronic services/new processes;
- event organisation services (catering);

- acquisitions of dissemination and information materials (posters, roll-ups, pamphlets, folders, pens) and press releases;
- services for the implementation of the new IT platform, including training of users/administrators;
- archiving services for the electronic storage of documents.

4.12.4. **Project results**

Following the implementation of SIPOCA 571, a complete electronic communication channel between citizens and public officials has been completed, increasing the efficiency of this relationship through the expected results of the project, namely:

- the front-office digital platform (portal type) to ensure online access to the services managed and provided by the municipality, including the geospatial map;
- the back-office digital platform is configured, implemented and integrated with the front-office platform;
- configured electronic services in the municipality's portal, accessible to the beneficiaries of public services;
- staff trained in the use and management of the implemented digital systems.

Currently, the citizens of Bacău have access to the following electronic services

- online application for the issuance of a tax certificate;
- online submission of the application for the issuance of the town planning certificate;
- online consultation of the tax situation;
- online submission of applications for operating permits;
- submission of petitions and complaints;
- issue of laissez-passer permits;
- confirmation of payment of fines;
- access to public information.

4.12.5. **Cost of implementation**

The total project value was 2,814,717 lei (approx. 580,000 Euro), of which 54,676 lei (approx. 11,000 Euro) was contributed by the Municipality of Bacău.

4.12.6. In hindsight: lessons learned & recommendations

The project was successful due to its results, which can be adopted by other public institutions in Bacău.

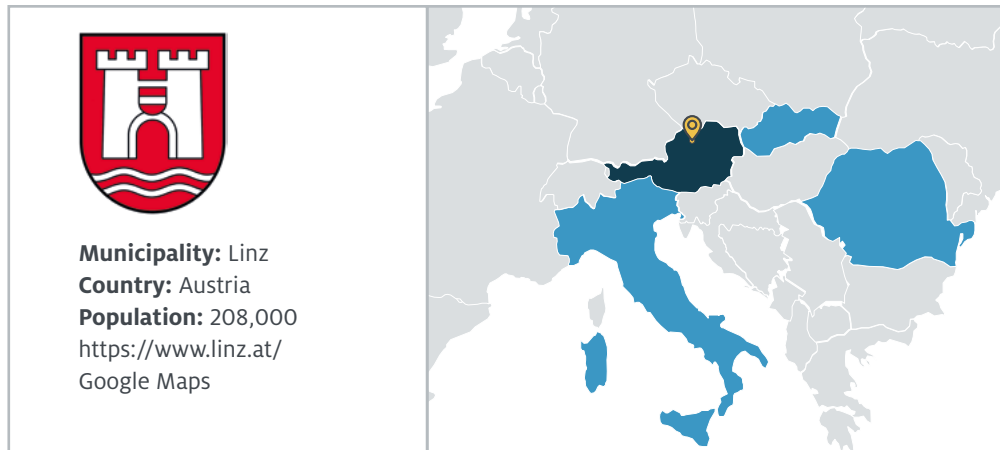
The project was completed in May 2022. Due to the pandemic, the finalisation took 41 months (10.12.2018 - 09.05.2022).

Contracting ITC services to compensate for the lack of experience of the staff of the Bacău Municipality was essential for the project's success.

WHAT CAN BE LEARNED?

- Improving the administrative efficiency requires a comprehensive involvement of various stakeholders (public, private and the community).
- Applying to specialists is more cost-effective in the long run, and prevents the negative effects of the overconfidence bias, especially within teams lacking experience in similar projects.
- Communication between stakeholders is crucial for the completion of a project.
- When planning, always consider the unexpected, and cover the risks accordingly.

4.13. PROCESS MANAGEMENT IN LINZ



Short Summary:

Process management should help the local administration to focus on its client's needs and demands. It should significantly improve the administration's efficiency and support and drive forward digitalisation. Repetitive processes should be standardized, leading to a higher and more consistent quality of results. Process management depends heavily on digitization and fosters digitalisation at the same time. Process management should lead to an integrated approach involving all actors of a particular process.

Before this project was implemented, the municipal administration of Linz was structured predominantly organizational and not process-oriented. This means that the administrative staff did their part of the work within their organizational unit, e.g. their department. However, they didn't consider the bigger picture, i.e. the interdependencies with other departments and branches.

The project was strongly driven by the head of Linz's municipal administration, Ulrike Huemer. Before moving to Linz, she worked for the local administration of Austria's capital, Vienna. There she got used to a process-oriented administration. When she took office in Linz, she immediately insisted on implementing a similar system in Linz as well. The main point in shifting towards process management is that an organizational structure comes with a too-isolated perspective, negatively affecting responsibility and accountability. For example, suppose the tasks to be carried out by a certain department are triggered by receiving a formal request. In that case, they might only care about the procedures starting after receiving the request without considering what is happening before the reception of the request, e.g. the usability of the request form itself and possible delays on the request's way to the department. In process management, these preparatory and necessary steps are considered part of the process.

It is necessary to distinguish between process management and project management. Processes are repetitive tasks, i.e. tasks that need to be carried out frequently and that can be standardized. In contrast, projects are unique activities that should lead to the realization of a specific goal. For example, the development of a new website is a project.

4.13.1. Goals of the project

The idea behind process management is to plan and carry out repetitive, standardized activities in an integral way. Most activities consist of many different tasks carried out by different people, departments, organizational branches or even numerous institutions. In process management, these activities are no longer seen as a sequence of isolated tasks but as one integral process. Efficient process management requires every single task to be examined and described in detail to get a clear idea of who is doing what and by what means.

By implementing process management in Linz, the local administration strived to become an administration that focuses on its client's needs and demands. The group of the administration's clients consists of citizens and many other internal and external stakeholders, e.g. companies or public institutions.

Process management depends heavily on digitalisation. All process analyses occur in digital solutions, and special software creates all process visualizations, like the process map. Therefore, while process management is mainly about how the organisation works, it can be seen as a digitalisation project. Without the necessary digital backend, there would be no process management.

The City of Linz aims to significantly improve its efficiency by implementing process management. They expect to become quicker in fulfilling their responsibilities and want to considerably increase the quality of their work results. Faster processing is anticipated due to reduced interfaces, omission of redundancies, digitalisation of procedures and an overall increased internal efficiency. Besides that, process management can also lead to lower costs and more flexibility. Already at this point, when process-oriented management is still not fully implemented, the local administration sees apparent positive effects of this new management paradigm.

The main objective pursued by this project is to make the local administration more efficient and modern. Processes should be standardized, and this standardization should lead to a higher and more consistent quality of results. Interfaces between different departments should be reduced or streamlined, leading to higher quality and quicker processing. Also, redundancies should be detected and omitted, like tasks carried out twice by different departments.

Another goal is to ensure interdependencies between different branches and departments are considered. Administrative tasks often require departments to collaborate, i.e. one department needs certain information from another and then transfers the task to a third one. In an organizational administration, all departments focus on their part of the work without paying too much attention to their own activities' effects on other departments. Process management strives to change this, trying to implement an integrated approach involving all actors involved in a particular process.

4.13.2. Existing solutions considered by the municipality

It was clear from the beginning that process management should be the key to reaching the goals that had been set, including supporting digital transformation. Process management allows the administration to thoroughly analyse and improve its administrative procedures. Describing and visualizing processes in detail enables the administration to reflect on how they handle their responsibilities. It helps them to get a clear view of possible inefficient procedures and redundancies. They can analyse whether any tasks are missing to reach the aims set. Moreover, they can analyse whether the tasks are carried out in the correct order and whether they are assigned to different actors, such as staff members and departments, efficiently. Process management also makes it possible to check if information flows within the organization are efficient. Additionally, process management plays an essential role in digitalisation.

Before implementing the project, the team had to choose an appropriate software tool to manage the processes. It needed to store the information, make it accessible to all relevant actors and visualize it. Several software solutions were available for this purpose, and the team chose Adonis. This software was most convincing because of its capable reporting system. Subsequently, this software was further adapted to the local administration's needs. At this point, reports are mainly used to export the processes with their descriptions. In the future, the software's powerful reporting system is expected to be used for numerous analyses and reports.

No legal or political obstacles needed to be overcome to implement this project. It is a solely internal administrative project, meaning the local administration did not need a political decision to implement process management. As it is only about the local administration's internal procedures, there were no problems regarding data protection or any other regulations.

4.13.3. Implementation phase

The first step was to define a common standard and definition of process management for the entire local administration. For each administration branch, so-called process coaches were chosen and trained to implement process management. Then, they started working with the individual departments in their branch to ensure that all standards and goals the project management team set were met.

When implementing process management, it is necessary to thoroughly analyse all processes carried out by the administration. As the local administration of Linz is quite large, the number of processes that need to be analysed is quite high. These activities are led by the process coaches.

Each process carried out by the branch's departments and its staff is first analysed. Then possible optimizations are discussed, especially regarding possible efficiency improvements and necessary modernizations due to changed demands. These decisions are made by a team of representatives of all departments in the respective process. Finally, the final process must be imported into the process map to visualize it.

The project development started in the summer of 2021. By summer 2023, all administrative branches are scheduled to begin the implementation of process management. The workload that goes along with implementing this project varies heavily between departments. There are departments with 20 processes and up to 100 processes. In those departments that have started implementing process management, up to 20 processes have already been analysed. It is impossible to give an exact number of how many processes will remain finally. Several hundred processes are expected to become part of the process management system.

4.13.4. **Project results**

While process management will be fully implemented at some point, it is still a “never-ending” project. Processes must be continuously monitored, updated, adapted to new expectations and demands, and, if possible, further improved.

The first department to implement process management was the department of the head of local administration. The second department was the Department for Personnel and Joint Services. So far, the project has not been rolled out to all departments. Nevertheless, the first results and effects of process management in those departments that have already implemented it are highly promising. The local administration is convinced that process management will help drastically improve their work's quality and adapt much better to future demands and expectations.

An essential part of process management is the process map. This map illustrates the clusters processes can be categorized in. When selecting a cluster, the map “zooms in” and reveals the processes that are part of this cluster. Then these processes can be viewed further in detail. Processes that are related to each other are visually connected, like a mind map.

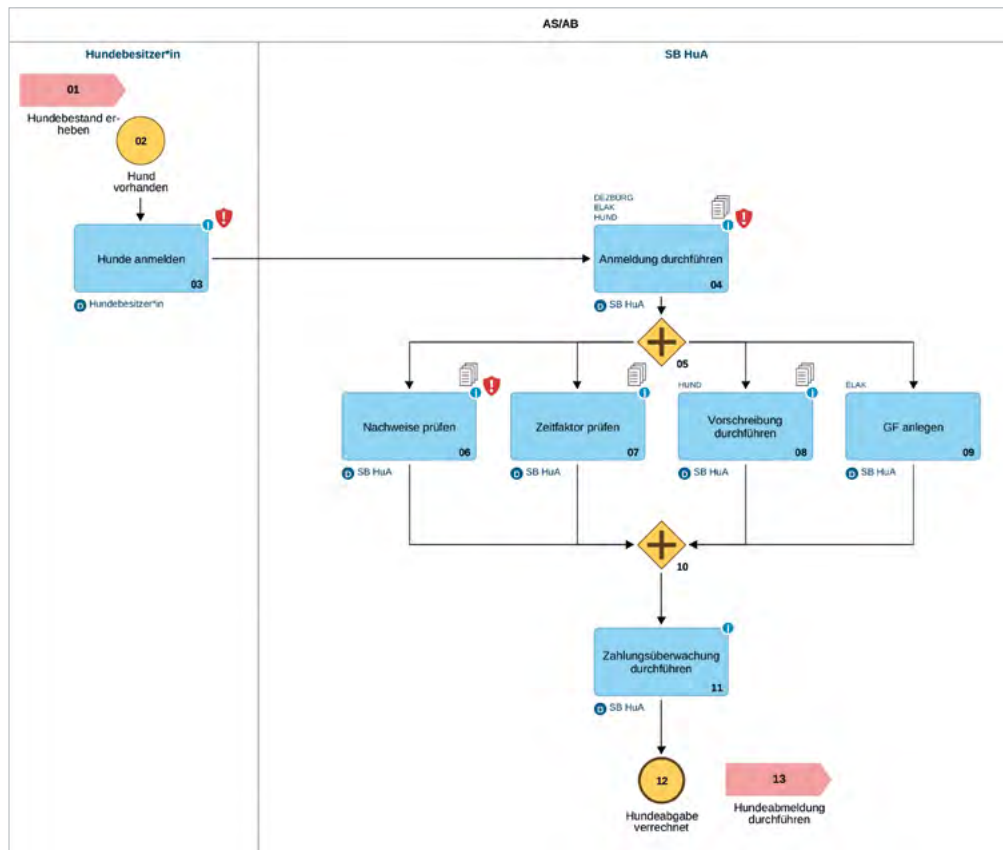
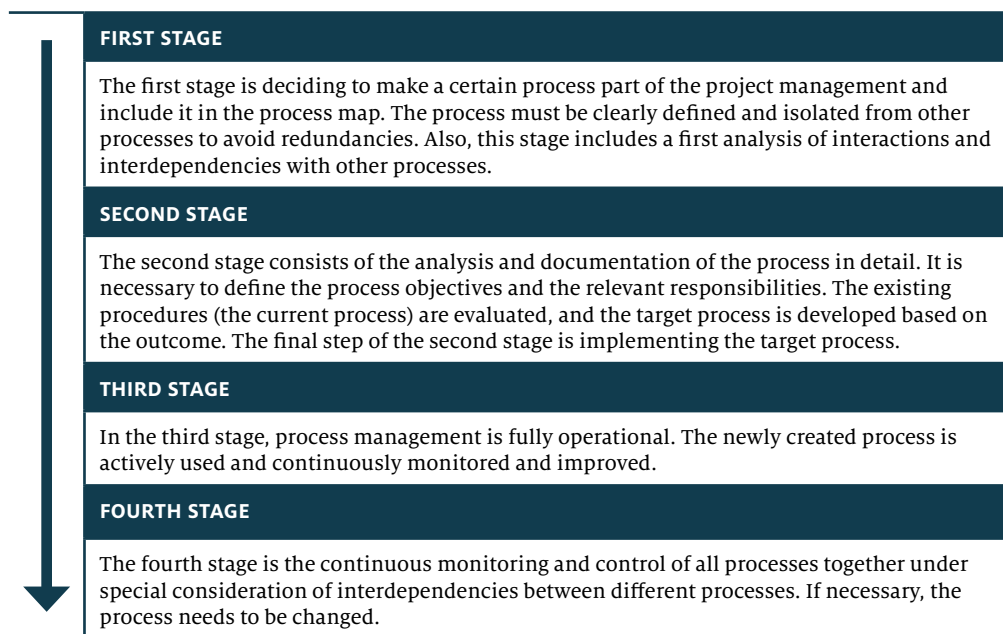


Figure 21: Process map example
 Source: Magistrat Linz

In Figure 21, the process map for collecting dog taxes is displayed. When dog owners submit registration forms for their dogs, the process continues to be handled by the relevant department, which processes the dog’s registration. Then they need to check the documentation and other relevant factors and inform the dog owner about the tax that needs to be paid. Payment collection is part of this process too. In case the dog is deregistered, the process instance is terminated. The main goal of this process is to give new staff members a quick overview of all relevant tasks.

Process management is implemented in 4 stages.



While the depth of detail varies from process to process and department to department, some basic information is part of basically every process. This includes:

- the name of the process;
- its purpose;
- the process' target group;
- the target group's expectations;
- the process trigger(s);
- process result(s);
- the first and last procedure that is part of the process;
- input and output interfaces;
- staff responsible for the process;
- documents about the process;
- information about indicators used to assess the process results.

During these four stages of implementing process management, digitalisation is strongly focused. This happens mainly in the second phase. This step analyses the process, and a target process is designed. For example, the City of Linz uses an electronic document management system called *ELAK* (“*elektronischer Akt*”). During the implementation of process management, the relevant staff analysed whether and how *ELAK* is being used in this process. If it is not used yet, then implementation of *ELAK* is initiated.

While implementing this project, hesitation or resistance of local administration staff remains one challenge to overcome. Part of the local administration is reluctant to change the well-established procedures they are used to, especially for repetitive tasks. They are not used to questioning their daily activities and tend to explain their way of working by saying that this has always been done. Changing this mindset and convincing them of process management as an opportunity is an important part of the successful implementation of this project.

4.13.5. Cost of implementation

The project is implemented by the local administration during their regular work time. The four so-called process attendants, who lead and monitor the project's implementation, spend around 500-700 hours on this project. There is no information on how many hours are invested in implementing this project by others. The working hours of process coaches are not separately recorded. Besides the personnel costs, there were expenses for the chosen software. There were no other substantial costs besides the work time invested in implementation and the software.

4.13.6. In hindsight: lessons learned & recommendations

The project is still in the implementation phase, which means it might be too early to present a detailed set of lessons learned. However, as mentioned, the local administration already attests to very positive effects.

One main challenge when implementing process management is to make sure that the mindset of all involved actors is gradually adapted. Both to see all procedures as processes and all tasks as part of an integral process. This also involves explaining the advantages and benefits of process management. The aim is to convince everybody of the idea behind this project, which is top-level-driven by the head of administration, Ulrike Huemer.

Another challenge is finding the right so-called “flight level” when looking at the processes and the tasks they consist of. This is especially important when creating visualizations like process maps. The kind of visualization also depends on how the department intends to use it. For example, some departments want to use visual process maps as training resources for new staff. Others want to use it as a basis for discussion about process improvement. Still, others want to use it to get a better overview of the department's tasks.

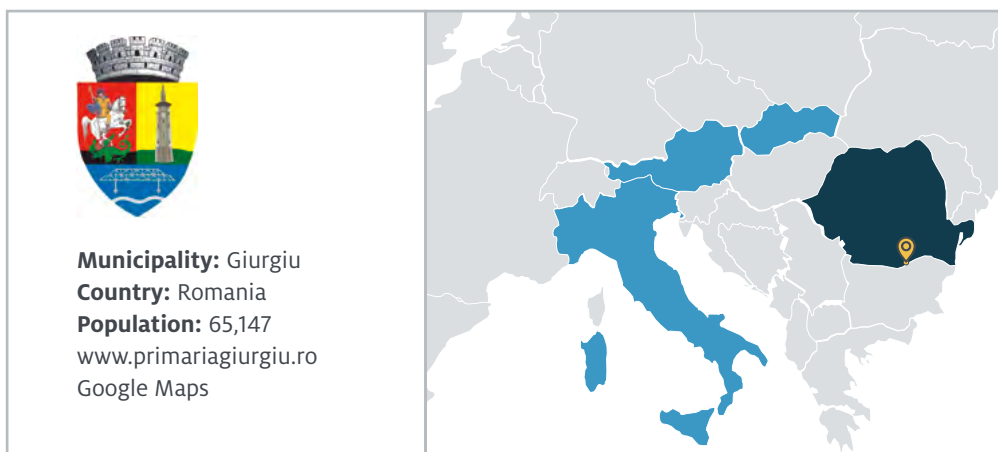
The suitability of process management for municipalities doesn't depend on the number of inhabitants or the size of the administration. All organizations, even very small ones, have procedures carried out by more than one actor or department. These procedures can be analysed and planned as processes. The ability of municipalities to successfully implement

process management mainly depends on the necessary funds and the willingness and readiness of administration staff to change their way of working and to adapt their mindset towards a client-oriented approach.

WHAT CAN BE LEARNED?

- Process management can help to increase a local administration's efficiency and to ensure a high and consistent quality of work.
- Convincing all actors involved in or affected by the project is crucial for a successful implementation.
- It is crucial to choose an appropriate and capable software solution.
- The local administration's mindset must be adapted to the ideas behind process management.
- Process management is a necessary basis and milestone in digitalisation.

4.14. MODERN ADMINISTRATIVE MECHANISMS AND PROCEDURES IN GIURGIU CITY HALL (MEPAM)



Short Summary:

The Municipality of Giurgiu uses the project to increase institutional capacities regarding fundamental decisions and strategic planning in the long term and to implement innovative digital systems to simplify service delivery to the citizens.

In a period of widespread digitization and computerization, more and more entities must get involved in implementing projects to bring computer systems into every community and municipality.

The Strategy for consolidating the public administration 2014-2020 was approved by the Government Decision no. 909/2014. Moreover, the establishment of the National Committee for the coordination of the implementation of the Strategy for the consolidation of the public administration 2014-2020 aimed that by 2020 Romania would have an efficient public administration responsive to society's needs.

The Strategy is an integrated document that considers three key elements.

- the need to remedy some structural deficiencies in the functioning of the public administration;
- the specific country recommendations formulated by the European Commission regarding public administration;
- the need to ensure/prepare the public administration to fulfil the obligations assumed at the European level regarding a series of targets/objectives established by the Europe 2020 Strategy, the better regulation strategy.

The main objectives of this Strategy are:

- adapting the structure and mandate of the administration to the needs of the citizens and the real financing possibilities;
- implementation of efficient management in public administration;
- debureaucratization and simplification for citizens, businesses and administration;
- strengthening the capacity of public administration to ensure quality and access to public services (https://sgg.gov.ro/docs/File/UPP/doc/proiecte_finale/strategie_adm_publica_1_.pdf).

4.14.1. Goals of the project

The main objective of the Project “Modern administrative mechanisms and procedures in Giurgiu City Hall” (MEPAM) is to modernize the mechanisms and administrative procedures at the level of Giurgiu Municipality in order to increase the institutional capacities regarding fundamental decisions and strategic planning in the long term, as well as reducing bureaucracy, by implementing and supporting the measures of simplification, for services provided to the community.

Secondary objectives:

- Elaboration and development of the Sustainable Development Strategy (SDD) for the future programming period.
- Development and implementation of an online participatory budgeting mechanism.
- Develop and implement a one-stop online and physical system to cover services to citizens and the business environment. Develop an IT solution to ensure the electronic administration of documents created, received or prepared for internal use.
- Modernization of administrative mechanisms and procedures at the level of Giurgiu Municipality in order to increase the institutional capacity regarding the foundation and long-term strategic planning.

The contracting authority aims at implementing the online participatory budgeting mechanism, the online and physical one-stop-shop IT system, and the IT solution to ensure the electronic administration of the documents created, received or drawn up for internal use within the institution.

4.14.2. Implementation phase

The project was implemented in the programming period of 2 years, and no other new activities or work packages were added during this process. All responsibilities were clear from the beginning, proving good planning. The goals/objectives of the project were met through an accessible and transparent public administration and judicial system.

During the project planning/submission, the municipality tried to align with Sustainable Development Goals. This project resulted from the Sustainable Development Strategy (SDD) of Giurgiu Town for 2021-2027, which had the accomplishment of SDGs in view.

For the planning or carrying out of the project activities, the Giurgiu Town Hall benefited from external support by involving some commercial societies (SC AMM SRL, SC SUN-SHINE PRODUCTION & PROMOTION SRL, SC FUTURE SKY MEDIA), after a careful analysis of the existing situation and discussions with the institution's decision-makers.

The institution employees had specific skills/education to help and support the municipality in the project. They did not need specific training to carry out the project. However, within the project, 64 people (local elected officials, management and executive staff) were trained to acquire the necessary knowledge and skills to create this one-stop shop.

Also, the project stages did not need the involvement of academia, e.g. universities and research institutions. During the project implementation period, no conflicts appeared between different types of stakeholders.

The stakeholders or citizens were informed about the project through specific communication channels (SC. FUTURE SKY MEDIA). The messages of public interest were automatically transmitted at the local level. For example, the information about this project was disseminated through the Giurgiu Town Hall website (<https://primariagiurgiu.ro/>), social media (Facebook platform) or some local media (e.g., Realitatea de Giurgiu - <https://realitateadegiurgiu.net/>, Eveniment Gr - <https://evenimentgr.ro/>, Opinia Giurgiu - <https://opinia-giurgiu.ro>, Journal Giurgiuvean - <https://jurnalgiurgiuvean.ro/>).

4.14.3. Project results

The main results are:

- the elaboration of the Sustainable Development Strategy (SDD) of Giurgiu Municipality;
- elaborated participatory budgeting mechanism;
- IT system of the one-stop-shop type online and physically functional;
- internal online office;
- mobile application for citizens;
- automatic transmission of messages;
- online appointments for services offered by the administration;
- automatization of revenue/taxes management activity.

By involving the community, priorities are established for better transparency of the decision-making process at the public administration level. Concretely, through this process, the people of Giurgiu will have the chance to actively contribute to the city's administration by submitting different projects. The participants can be individuals and legal entities (associative structures, NGOs, foundations). The projects would be submitted, analysed, evaluated and subsequently declared winners and implemented with funding from Giurgiu City Hall, the initiator having the capacity of observer, sponsor or volunteer.

The areas established for the first cycle to finance projects thought up by community members are 1. Street infrastructure; 2. Organizing the green spaces; 3. Mobility, street accessibility; 4. Organizing the public areas and urban furniture; 5. Educational activities; 6. Cultural activities; 7. Social; 8. Health; 9. Sports activities; 10. Environmental protection; 11. Digitization.

The effects impacted, on the one hand, the population by improving the services, shortening the waiting time, and the administration by improving the services and shortening the operating time on the other hand.

4.14.4. Cost of implementation

The project implementation period was 24 months, from September 2018 until September 2020.

The project has a total value of 3,763,974 lei (810,000 Euro) (the financing contract 296/13.12.2018), non-refundable funding through the *Administrative Capacity Operational Program (POCA)* and an implementation period of 24 months.

4.14.5. In hindsight: lessons learned & recommendations

Almost all of the proposed initial objectives were met at the end of the project.

The achievement of the main objective of modernizing administrative mechanisms and procedures and reducing bureaucracy in this project could be a good practice example for replication by other municipalities.

The project strengthens resilience and sustainability and better aligns local government operations with national digital strategies by developing and implementing an online participatory budgeting mechanism.

Reducing bureaucracy and simplifying procedures, both internally and externally, are likely to make the activity of the public administration more efficient (from the perspective of costs and reaction time). Furthermore, increasing transparency and integrity in providing services improve citizen satisfaction and the public administration's image.

In future similar projects, developing the IT system for interaction with citizens should be a priority since this solution will increase digital development. Everything will be available in a web interface, accessible from anywhere, including mobile terminals.

WHAT CAN BE LEARNED?

- Involving external stakeholders proved beneficial for the planning stage and managing the project activities afterwards.
- Local community could participate actively in realising of the municipality project portfolio.
- Increasing transparency improves citizens satisfaction regarding the interaction with public authorities.

5.

Conclusion

5. Conclusion

Digitalisation has become an integral part of our daily lives. We are always connected and expect access to information and services from everywhere. There is great potential in providing public services using digital means and ICT tools. The digitally delivered public services present ways to rationalise the provision of competencies that the municipalities and cities have, to engage inhabitants in governance, to enhance the provision of public services qualitatively, to base public policymaking on evidence and to take transparency and openness into consideration when providing public services.

Despite the advantages, the public sector – especially smaller public entities such as municipalities – can face challenges when digitalising public services and administrative processes. This handbook aims to support municipalities of all sizes on their way to digital administration by providing concrete and practical examples of projects and services successfully implemented by its peers.

Some of the good practice examples in this are specific projects with a narrow focus, while others are more strategic in nature. However, the showcased examples are well integrated in the municipality's public administration in both cases. Therefore, a general takeaway of this handbook is the importance of a strategic plan in the municipal administration to deal with digitalisation.

Even though digitalisation might be a struggle for municipalities all over Europe, not innovating and remaining stuck in the past is not an option. Hopefully, this handbook will help practitioners focus their digitalisation efforts on areas where other municipalities have already succeeded and learn from their experiences.

List of figures

List of tables

List of figures

Figure 1: Countries' performance in the DESI index.....	21
Figure 2: Comparison of Slovakia, Austria, Italy and Romania in the DESI index.....	22
Figure 3: Key figures of the eGovernment Benchmark in Austria, Italy, Slovakia and Austria.....	23
Figure 4: oesterreich.gv.at – Austria's e-government platform for citizens.....	26
Figure 5: usp.gv.at – Austria's e-government platform for businesses.....	27
Figure 6: Main objectives of Romania's Digital Agenda.....	33
Figure 7: DESI 2022 –relative performance by dimension in Romania.....	35
Figure 8: Preconditions and areas of the digital transformation in the Slovak Republic.....	42
Figure 9: Central e-government portal slovensko.sk.....	44
Figure 10: GSM network container filling sensor.....	56
Figure 11: Energy Report Online – Lana's energy consumption in 2021.....	66
Figure 12: Kežmarok GEO Information system.....	70
Figure 13: Notification of the need for maintenance.....	79
Figure 14: Report of the sidewalk maintenance.....	80
Figure 15: Adopted sidewalks map overview.....	81
Figure 16: Alexa in the Municipality of Kremsmünster.....	86
Figure 17: Process for posting official ordinances in Austrian municipalities.....	93
Figure 18: Electronic official boards in different Austrian municipalities.....	96
Figure 19: Example of a digitally signed and stamped ordinance.....	96
Figure 20: MSP SOS App used in the City of Kežmarok.....	106
Figure 21: Process map example.....	116

List of tables

Table 1: Digital Economy and Society Index structure.....	20
Table 2: e-Government public policy 2021-2030 main objectives.....	38
Table 3: IoT fields of the Integrated Action Plan for the city Kežmarok.....	57
Table 4: Funding sources for the Integrated Action Plan for the city Kežmarok.....	58

Bibliography **About the authors**

Bibliography

- Action plan for the digital transformation of Slovakia for the years 2023-2026. Available at: <https://www.mirri.gov.sk/wp-content/uploads/2023/01/APDTS-2023-2026.pdf>.
- Adopt a Sidewalk portal, 2023. via Berinšter (2023).
- Agency for Energy South Tyrol – CasaClima, n.d.. Energiebericht Online. Available at: <https://www.klimahaus.it/de/klimagemeinde/energiebericht-online-1565.html>.
- Agentur für Energie Südtirol – KlimaHaus, 2016. Der Energiebericht Online. Energiekosten im Griff!. Available at: https://www.klimahaus.it/smarteredit/documents/inhalte/_Inhalte_Publicationen/_published/Der%20Energiebericht%20Online.pdf.
- AGID, 2023. Piano Triennale per l'informatica. Available at: <https://www.agid.gov.it/it/agenzia/piano-triennale>.
- Aichholzer, G., & Burkert, H., 2004. Public Sector Information in the Digital Age: Between Markets, Public Management and Citizens' Rights. Edward Elgar Publishing.
- App Winter maintenance City of Košice.
- Association of Towns and Communities of Slovakia, 2023a. Digital restart. Available at: <https://digitalnyrestart.sk>.
- Association of Towns and Communities of Slovakia, 2023b. ZMOS – characteristics, activities and structure. Available at: <https://www.zmos.sk/zmos.html>.
- Berinšter, P., 2023. Interview with the Košice City Council member realised on the 9th of February 2023.
- Bloomberg, J., 2018. Digitization, digitalization, and digital transformation: confuse them at your peril. Forbes. Retrieved on August, 28, 2019.
- Brown, D., 2005. Electronic government and public administration. *International Review of Administrative Sciences*, 71(2), 241–254. <https://doi.org/10.1177/0020852305053883>.
- Bundesministerium für Bildung, Wissenschaft und Forschung, 2020. Digitale Schule. Available at: <https://digitaleschule.gv.at/>.
- Bundesministerium für Digitalisierung und Wirtschaftsstandort, 2016. Die digitale Strategie der österreichischen Bundesregierung. Available at: <https://www.digitalroadmap.gv.at/>.
- Bundesministerium für Finanzen, 2022. Wirkungsbereich. Available at: <https://www.oesterreich.gv.at/lexicon/W/Seite.991364.html>.
- Bundesministerium für Finanzen, n.d. a. Austria's digital government agency. Administration where I am. Available at: <https://www.oesterreich.gv.at/>.
- Bundesministerium für Finanzen, n.d. b. The digital Business Service. Your Business - simply online. Available at: <https://www.usp.gv.at/en/index.html>.
- Bundesministerium für Finanzen, n.d. c. Open Data Austria. Available at: <https://www.data.gv.at>.
- City Union, 2023. About the Union. Available at: <https://www.uniamiest.sk/o-unii>.
- Curs de guvernare, 2021. "Un an de marș al digitalizării – Administrația, de la basic la nivelul următor". Available at: <https://cursdeguvernare.ro/digitalizarea-administratiei-romania-plan.html>.
- Dipartimento per la trasformazione digitale, 2022. Reti ultraveloci. Available at: <https://innovazione.gov.it/italia-digitale-2026/il-piano/reti-ultraveloci/>.
- Dipartimento per la trasformazione digitale, 2023. Digitalizzazione della PA. Available at: <https://innovazione.gov.it/italia-digitale-2026/il-piano/digitalizzazione-della-pa/>.

- Dipartimento per la trasformazione digitale, n.d.. Italia digitale 2026. Available at: <https://innovazione.gov.it/italia-digitale-2026/>.
- eGovernment Benchmark, 2022. eGovernment Benchmark 2022. Synchronizing Digital Governments. Country factsheets. Luxembourg: Publications Office of the European Union, 2022. ISBN 978-92-76-49793-6.
- European Commission, 2022a. Digital Economy and Society Index (DESI) 2022. Thematic chapters. Available at: <https://digital-strategy.ec.europa.eu/en/policies/desi>.
- European Commission, 2022b. The Digital Economy and Society Index – Countries' performance in digitisation. Available at: <https://digital-strategy.ec.europa.eu/en/policies/countries-digitisation-performance>.
- European Commission, 2022c. Digital Economy and Society Index (DESI) 2022 – Romania. Available at: <https://ec.europa.eu/newsroom/dae/redirection/document/88717>.
- European Commission, 2022d. DESI by components. Available at: https://digital-agenda-data.eu/charts/desi-components#chart={%22indicator%22:%22desi%22,%22breakdown-group%22:%22desi%22,%22unit-measure%22:%22pc_desi%22,%22time-period%22:%222021%22}.
- European Commission, 2023. DESI Simulation Tool. DESI – Compare countries progress. Available at: [https://digital-agenda-data.eu/charts/desi-see-the-evolution-of-two-indicators-and-compare-countries#chart={%22indicator%22:%22desi_total%22,%22breakdown%22:%22desi_total%22,%22unit-measure%22:%22pc_desi%22,%22ref-area%22:\[%22AT%22,%22EU%22,%22IT%22,%22RO%22,%22SK%22\]}](https://digital-agenda-data.eu/charts/desi-see-the-evolution-of-two-indicators-and-compare-countries#chart={%22indicator%22:%22desi_total%22,%22breakdown%22:%22desi_total%22,%22unit-measure%22:%22pc_desi%22,%22ref-area%22:[%22AT%22,%22EU%22,%22IT%22,%22RO%22,%22SK%22]}).
- European Commission, n.d. a. Recovery and Resilience Facility. Available at: https://commission.europa.eu/business-economy-euro/economic-recovery/recovery-and-resilience-facility_en.
- European Commission, n.d. b. Digital Europe Programme. Available at: https://commission.europa.eu/funding-tenders/find-funding/eu-funding-programmes/digital-europe-programme_en.
- European Parliament, 2022. Digital Agenda for Europe. Available at: <https://www.europarl.europa.eu/factsheets/en/sheet/64/digital-agenda-for-europe>.
- Färber, G., 2021. Leere Kassen nach Corona - Spendere bene per ripartire meglio. Eurac Research. Available at: <https://www.youtube.com/watch?v=gli7fU3bmOs&t=2852s>.
- Ferenčák, J., 2021. Through Kežmarok, the Association of Towns and Communities of Slovakia focused on specific Smart solutions. Available at: <https://www.zmos.sk/oznamy/zmos-sa-cez-kezmarok-sustredil-na-konkretne-smart-riesenia-.html>.
- Gasslitter, S., & Fischer, S., 2019. Die Zukunft der Verwaltungsinformatik im Zeichen der Digitalisierung – Anwendungsfall Blockchain in Südtirol BT - Verwaltung, eGovernment und Digitalisierung: Grundlagen, Konzepte und Anwendungsfälle (A. Schmid (ed.); pp. 141–154). Springer Fachmedien Wiesbaden. https://doi.org/10.1007/978-3-658-27029-2_11.
- Gil-Garcia, J. R., & Luna-Reyes, L. F., 2006. Integrating Conceptual Approaches to E-Government. In Encyclopedia of E-Commerce, E-Government, and Mobile Commerce (pp. 636–643). IGI Global. <https://doi.org/10.4018/978-1-59140-799-7.ch102>.
- Gray, J., & Rumpe, B., 2015. Models for digitalization. Software & Systems Modeling, 14(4), 1319–1320. <https://doi.org/10.1007/s10270-015-0494-9>.
- Heuermann, R., 2018. Einleitung BT - Digitalisierung in Bund, Ländern und Gemeinden: IT-Organisation, Management und Empfehlungen (R. Heuermann, M. Tomenendal, & C. Bressemer (eds.); pp. 1–8). Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-662-54098-5_1.
- Kežmarok, 2022a. The city joined the international IoTxChange project. Available at: <https://www.kezmarok.sk/aktuality/2022/mesto-sa-zapojilo-do-medzinarodneho-projektu-iotxchange/>.
- Kežmarok, 2022b. Urbact IoTxChange. Available at: <https://www.kezmarok.sk/projekty/urbact-iotxchange/>.
- Kežmarok, 2022c. Urbact small scale action. Available at: <https://www.kezmarok.sk/aktuality/2022/urbact-small-scale-action/>.

- Kežmarok, 2022d. Report on the activities of the Kežmarok City Police 2021. Report presented on the Municipality's councils meeting on the 24th of February 2022.
- Košice, 2022. Winter maintenance cost the city more than 3 million Euro, residents of the city Košice adopted 707 sidewalk sections. Available at: <https://www.kosice.sk/clanok/zimna-udrzba-stala-mesto-vyse-3-miliony-eur-kosicania-si-adoptovali-707-usekov-chodnikov>.
- Košice, 2020a. Residents of Košice will be able to shovel sidewalks during the winter and earn money while doing so. Available at: <https://www.kosice.sk/clanok/kosicania-budu-moct-pocas-zimy-odhrnat-chodniky-a-popri-tom-si-zarobit>.
- Košice 2020b. Winter maintenance App. Information about the project. Available at: https://static.kosice.sk/article/KORQMTERQpgzO3Ru/nn_zimna_udrzba.pdf.
- Lappi, T., Aaltonen, K., & Kujala, J., 2019. Project governance and portfolio management in government digitalization. *Transforming Government: People, Process and Policy*, 13. <https://doi.org/10.1108/TG-11-2018-0068>.
- Magistrat Linz (2021). *Programm Digitales Linz*.
- Markočiová, M. and D. Cintula, 2022. City of Kežmarok. Integrated Action Plan. Available at: https://www.kezmarok.sk/wp-content/uploads/2022/03/IoTXchange_IAP_Kezmarok_Final.pdf.
- Marktgemeinde Lana, 2022. *Energiebericht 2021*. Available at: https://www.gemeinde.lana.bz.it/de/Energiebericht_Lana_2021.
- Mosse, D., 2017. Is good policy unimplementable? Reflections on the ethnography of aid policy and practice. *The Anthropology of Organisations*, 35(4), 451–483. <https://doi.org/10.4324/9781315241371-37>.
- Ministry of Investments, Regional Development and Informatization of the Slovak Republic, 2019. 2030 Digital Transformation Strategy for Slovakia. Strategy for transformation of Slovakia into a successful digital country. Available at: <https://www.mirri.gov.sk/wp-content/uploads/2019/10/SDT-English-Version-FINAL.pdf>.
- Ministry of Investments, Regional Development and Informatization of the Slovak Republic, 2020. Statute of the Ministry of Investments, Regional Development and Informatization of the Slovak Republic. Available at: https://www.mirri.gov.sk/wp-content/uploads/2020/10/Statute_ENG.pdf.
- Ministry of Investments, Regional Development and Informatization of the Slovak Republic, n.d.. Central government portal. About us. Available at: <https://www.slovensko.sk/en/about-us>.
- National digital skills strategy of the Slovak Republic and Action plan for the years 2023-2026. Available at: <https://www.mirri.gov.sk/wp-content/uploads/2023/01/NSDZ-a-AP.pdf>.
- Program of Economic and Social Development of the City Kežmarok 2014 – 2020. Available at: https://www.kezmarok.sk/wp-content/uploads/2021/03/strategia_mesta_kezmarok_final-1.pdf.
- Provincia Autonoma di Bolzano – Alto Adige, 2022. La Giunta approva la strategia “Alto Adige Digitale 2022-2026” Available at: <https://news.provincia.bz.it/it/news/la-giunta-approva-la-strategia-alto-adige-digitale-2022-2026>.
- Rozgonyiová, P. 2021. The mobile app will support a sense of security and help in an emergency. Available at: <https://www.kezmarok.sk/aktuality/2021/aplikacia-v-mobile-podpori-pocit-bezpe-cia-a-pomoze-v-nudzi/>.
- Ručinská, S. & Fečko, M. 2019. Electronic services or smart cities – Current experiences and perspectives in the Slovak Republic. In: *CEE e. Dem and e. Gov Days 2019: Cyber Security and eGovernment*. Wien: Facultas Verlags, 2019. ISBN 9783708918983. pp. 471-480.
- Ručinská, S. & Fečko, M. 2020. eServices as a challenge for small municipalities - Slovak Republic experiences. In: *CEE e. Dem and e. Gov Days 2020*. Wien: Facultas Verlags, 2020. ISBN 9783903035270. pp. 383-392.
- Ručinská, S. & Fečko, M. 2021. eGovernment and digitalization in the Slovak Republic - current development and political strategies. In: *CEE e. Dem and e. Gov Days 2021*. Wien: Facultas Verlags, 2021. ISBN: 978-3-7089-2121-1. pp. 251-262.

- Salvado, M., 2022. #4 Small scale action I Kežmarok, Slovakia. Dealing with waste management in Kežmarok, the high-tech way. Available at: <https://urbact.eu/articles/4-small-scale-action-kezmarok-slovakia>.
- Secretariatul General al Guvernului României, 2023. CONFERINȚĂ FINALĂ A PROIECT. Available at: <https://egov.sipoca20.ro/welcome/page/de-spre-proiect>.
- SGG, 2021. Propunere de politică publică în domeniul e-guvernării. Available at: <https://io.1616.ro/media/2/2701/33605/20230318/1/propunere-de-politica-publica-in-domeniul-e-guvernarii-adoptata-3-iun-2021.pdf>.
- Schmid, A., 2019. Verwaltungsinformatik und eGovernment im Zeichen der Digitalisierung – Zeit für ein neues Paradigma BT - Verwaltung, eGovernment und Digitalisierung: Grundlagen, Konzepte und Anwendungsfälle (A. Schmid (ed.); pp. 3–21). Springer Fachmedien Wiesbaden. https://doi.org/10.1007/978-3-658-27029-2_1.
- Schratzenstaller, M., 2018. Implications of digitalisation on the public sector – A first overview. *Wirtschaftsdienst*, 98(11), 799–804. <https://doi.org/10.1007/s10273-018-2369-5>.
- Strategy and action plan for improving Slovakia's position in the DESI index until 2025. Available at: <https://www.mirri.gov.sk/wp-content/uploads/2022/01/Strategia-DESI-do-roku-2025.pdf>.
- Vaidya, K., & Campbell, J., 2016. Multidisciplinary approach to defining public e-procurement and evaluating its impact on procurement efficiency. *Information Systems Frontiers*, 18(2), 333–348.
- von der Leyen, 2021. President von der Leyen's speech at the high-level opening session of the 2021 Digital Assembly, "Leading the Digital Decade". SPEECH/21/2804. 1 June 2021. Brussels.
- West, D. M., 2011. Digital government: Technology and public sector performance. In *Digital Government: Technology and Public Sector Performance* (Vol. 9781400835). Princeton University Press.
- Winter maintenance, 2023. City of Košice. Official website. Available at: <https://zimnaudrzba.kosice.sk>.

About the authors

Alina Cerasela Avram

Alina-Cerasela Avram, Senior Researcher at the Institute for World Economy with experience coordinating studies in the digital and green transition fields, is a Bucharest Academy of Economic Studies graduate and has experience coordinating studies in the digital and green transition field. Alina is editor-in-chief and founder of the Junior Scientific Researcher online research journal. The publication was founded in 2015 after she won the Start-Up Smart funding project for young entrepreneurs. She also has vast experience in organising academic conferences, being part of the organising team of the “Romanian Conference for Education and Research”, an annual event organised by the Enformation company.

Josef Bernhart

Josef Bernhart is a Senior Researcher and Vice Head of the Eurac Research Institute for Public Management in Bolzano (Italy) and external lecturer at the University of Innsbruck, the Berlin School of Economics and Law, and the Carinthia University of Applied Sciences. His research focuses on international public management reforms, quality management in public sector organizations, social management, brand management, and sustainability management. Furthermore, he is a committed volunteer in the social and cultural area, especially as a member of the committee and leadership of the Catholic Labourers Association (KVW) and as a representative of the local social associations in the council of the AFI Institute South Tyrol (Institute for the Promotion of Employment).

Franziska Cecon

Since 2007 Franziska Cecon is Professor for Public Management at the Upper Austria University of Applied Sciences, in the Department of Healthcare-, Social-, and Public Management, which covers a part-time bachelor's and a master's programme. Her fields of interest are public management reforms and innovations at all governance levels but especially at the local level. Digital transformation, sustainability, and reorganisation schemes are only some of the current topics she is dealing with. Also, governance aspects like transparency, participation or outcome orientation are part of her profile. Regional management issues like inter-municipal cooperation, strategic development, resilience of regions or brown-field development are research topics she is recently involved in.

Peter Decarli

Peter Decarli is a researcher at the Institute for Public Management of Eurac Research in Bolzano, Italy, and an external lecturer at the University of Innsbruck, Austria. His research focuses primarily on Government Analytics, Public sector innovation and municipal management. Exploring data-driven advancements and innovations in the public sector as well as the possibility for international collaboration and knowledge exchange, are his aspirations for DiGreen and other projects.

Andreea Emanuela Drăgoi

Andreea-Emanuela Drăgoi, Senior Researcher at the Institute for World Economy, has a strong background in sustainable rural development policies and renewable energies. Mrs Drăgoi participated as an expert in numerous national and international research projects. Between 2013 and 2014, she participated as an expert in the Dialogue and experience exchange project regarding renewable energy policies, identifying opportunities for cooperation between China and Romania. Between 2014 and 2015, she worked as an editing expert and coordinated the volumes edited within the European Programme “Doctorial and post-doctoral programs for research support” - Impact of Socioeconomic and Technological Transformations at a National, European and World Level. Currently, she is a member of the Center for Writing European Projects research team in Climate Change under the Institute for World Economy coordination starting in July 2020.

George Cornel Dumitrescu

George-Cornel Dumitrescu, Senior Researcher and coordinator of the Department of Structural Changes in the World Economy of IWE, has a strong background in macroeconomics. Mr Dumitrescu has attended a significant number of scientific conferences at the national and international levels and published numerous scientific papers in various fields, including but not limited to the transition toward the circular economy and ICT. He is also a research expert at the Centre for Writing European Projects. Mr Dumitrescu has coordinated studies regarding the digital and green transition. He is responsible for managing and coordinating all project activities on the Romanian side.

Miroslav Fečko

Miroslav Fečko is an Assistant Professor at the Pavol Jozef Šafárik University in Košice, Faculty of Public Administration (Slovakia). In his research and teaching, he focuses on particular aspects of public administration, public policy, e-government, smart cities, municipalities and cities, communal management, disinformation, EU single market. The research orientation is evident in his engagement in national and international projects in recent years, focusing on Capacity building for an output oriented management in small and medium-sized municipalities; Functional city regions as an innovative approach for an integrated territorial development; Public administration education quality enhancement; Driving change and capacity building towards innovative, Entrepreneurial Universities; Strengthening the Resilience of Public Administration after COVID-19 with the Common Assessment Framework. He also acquired experience as the supervisor of mayors and employees of the self-government units regarding the implementation of the Municipality Data Centre, which was introducing e-government at the municipality level.

Mihaela Gramaticu

Mihaela Gramaticu has been a Research Assistant at the Institute for World Economy (Romanian Academy) since 2020. Previously, Mihaela gained seven years of teaching experience as a professional trainer, developing and designing training courses in development studies.

Among other activities in EU projects, she was an expert for the project “Long life learning training session for teachers to gain IT skills and TIC technologies for teaching and assessment of English language at European level” ID 62665.

She also has experience organising training sessions, conferences, workshops, and debates on the issues of formal education, working for eight years in a Learning Resource Centre affiliated with the Ministry of Education in Romania.

Melanie Gross

Melanie Gross is a researcher at the Institute for Public Management of Eurac Research in Bolzano, Italy. Her research focuses primarily on gender equality in politics and community innovation, including sustainable development of communities and cities.

Davide Maffei

Davide Maffei is a researcher at the Institute for Public Management of Eurac Research in Bolzano, South Tyrol, and a PhD student in Management at the University of Innsbruck, Tyrol. His research focuses primarily on the public administration and on public expenditure. He is originally from Trentino but completed his bachelor's studies in Political Science and Management and Economics as well as the master's program in Management, Communication & IT in Innsbruck. It is no wonder that he is often defined as a “child of the Euregio”.

Dana Bianca Mitrică

Bianca Mitrică, Senior Researcher and Head of the Human Geography and Regional Development Department, Institute of Geography, Romanian Academy, has a strong background in local and regional development. She was involved in 40 research projects focused on socioeconomic disparities in regional development, territorial competitiveness, cross-border cooperation and socioeconomic vulnerability to natural hazards. She was the national leader of the *Horizon 2020 Project*, “Social and innovative Platform on Cultural Tourism and its potential towards deepening Europeanisation”, 2020-2022. She coordinated WP6 Socioeconomic evaluation of the SEE Transnational Cooperation Program project “Climate Change Impacts on Water Supply”, 2009-2012 and is a research expert at the Centre for Writing European Projects.

Simona Moagăr Poladian

Simona Moagăr-Poladian, Senior Researcher and Managing Director of the Institute for World Economy from Bucharest, has experience in structural changes in the world economy, economic integration, and economic effects of climate change. Since 2020 she has been Professor Habil at the Romanian Academy of Doctoral Studies. Moagăr-Poladian is also a member of the Management Board of the Romanian European Institute from Bucharest.

Between 2014 and 2015, she was the project manager for a National Project for Doctoral and Postdoctoral Studies under European Social Fund and coordinated PhD and postdoctoral students in Fundamental and Applied Scientific Research. Since April 2020, she is also the project manager of the Centre for Writing European Projects in the field of Climate Change, submitted to the Institute for World Economy and funded by the Competitiveness Operational Program.

Tina Ortner

Tina Ortner has been working as a Research Associate since 2010 at the University of Applied Sciences Upper Austria in Linz. The research projects she is involved in focus on public administration, social services and innovations as well as accompanying social and acceptance research for technical innovations such as in the field of e-health, ambient assisted living and autonomous driving. Since 2022, she is also a lecturer at the Study Programme Social Pedagogue for the Youth Welfare Service and teaches scientific work and nutrition, as she is also a trained dietician.

Kurt Promberger

Kurt Promberger is a Professor of Public Management, e-Government & Public Governance at the Institute of Strategic Management, Marketing & Tourism at the University of Innsbruck (Austria). Furthermore, he is the Head of the Eurac Research Institute for Public Management (Bolzano, Italy). His research focuses on management-oriented public administration reforms in a comparative perspective, budget management, accounting reforms, digital government, quality management in public sector organizations, brand management and sustainability management.

Dominik Prüller

Dominik Prüller has joined the DiGreen project team in March 2022 as Researcher. He has a bachelor's degree in social economics. Besides his work for the DiGreen project, he mainly works with children and teenagers in the primary and secondary educational sector, focusing on non-formal education and socially disadvantaged young people.

Steliana Rodino

Steliana Rodino is a Senior Researcher with a background in Biotechnology and Bioeconomy, has a bachelor's degree in Environmental Economy and an M.Sc. in Biotechnologies for Environmental Protection. She has experience in the analysis of business environment for identifying flagship cases in specific areas (circular economy, bioeconomy, ecosystem services, food production); dissemination and transfer of technical and scientific knowledge to interested parties (business environment, public administration, farmers & associative forms, civil society); development of communication strategy for increasing the visibility of the research group and reaching a relevant audience.

Silvia Ručinská

Silvia Ručinská is a University Professor at the Pavol Jozef Šafárik University in Košice, Faculty of Public Administration (Slovakia). In her research and teaching activities, she focuses on the topics of public policy, public administration, governance, e-government, smart cities, disinformation, strategic management, leadership, and territorial development. As a lead research and researcher, she contributed in several projects, for example Driving change and capacity building towards innovative, Entrepreneurial Universities (InnoChange, EIT digital Project); Capacity building for an output oriented management in small and medium-sized municipalities (KoWist, Erasmus+ Project); Functional city region as an innovative approach for an integrated territorial development in the Slovak Republic conditions. She worked on several expertise and consultancies for concrete cities in the Slovak Republic. She is part of an international consortium that focuses on analysing disinformation in public policy (Counterfake). In the recent months, she also contributed to a study and analysis for OECD within the project Strengthening the Resilience of Public Administration after COVID-19 with the Common Assessment Framework (CAF).

Eurac Research

Institute for Public Management

Viale Druso 1

39100 Bolzano, Italy

T +39 0471 055 400

public.management@eurac.edu

www.eurac.edu