

IDRIJA

Mining Town – Industrial Hub – Smart City

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A. Background and introduction

Idrija is a partner city in the City Centre Doctor Project, an Action Planning Network in the URBACT Programme, where ten small cities are exploring initiatives to revitalise their city centres. During a study visit of the ten partner cities to Idrija in June 2017, a seminar on 'small cities as smart cities' were held using the example of Idrija as the topic for discussion. This article reflects the presentations made during the study visit.

This case study of Idrija aims to demonstrate that small cities in Europe can grasp the opportunities to become smart cities, with equal chance of success as the well-resourced big cities.

It is also a glimpse into how cities can work together with other cities and strategic partners to put building blocks and infrastructure in place for their local economies as well as for their social and community systems. This is critical to build resilience at a local level and to have confidence as small cities to deal with the challenges that the future holds.

Idrija is located in the south-eastern foothills of the Alps in Slovenia and has almost 12,000 inhabitants. It spans an area of 293.7 km². It is known for its industrial heritage as one of the main mercury mining locations globally and for its cultural heritage, lace-making and as the home of žlikrofi (traditional Slovenian dumplings). It has a UNESCO heritage designation.

Even though Idrija is small, with difficult road access, absence of trains and other connections, it has developed into an important global and regional node, with a growing economy. Idrija has a lower unemployment rate in 2017 than in the rest of Slovenia at 5.3% while the number on national level is 7.8%.

The Municipality of Idrija has a clear vision for the future and is constantly working in a way to achieve its goals namely: to be environmentally-friendly, socially just and high-tech developed. And all of this to be based on its rich industrial and cultural heritage. A strategy for building smart communities will result in a development of smart grids, smart mobility systems and smart governance. All the strategies are always based on the needs and demands of the environment and inhabitants.

Idrija has also entered the network of Alpine towns and communities where it is often recognized as a model town for smart community development, heritage reuse and youth engagement. The Municipality is in the process of adopting a sustainable urban mobility plan (SUMP), where electric mobility is recognized as one of the most important challenges for transition.

Idrija's success has a reason. It made a successful transition from a mining town to an industrial hub as the mayor explains:

*For 500 years knowledge has developed in the mine – and now it is successfully further developed by the companies **Kolektor** and **Hidria**. This is an example of successful transformation, especially if we compare the situation with some other environments or mines around the world, where after the closure there are only degraded environment and numerous social problems left behind.*

– Mayor, Bojan Sever

B. Idrija's involvement in projects and initiatives

European Union Programmes

The municipality of Idrija is involved in several EU projects and initiatives on smart mobility and energy efficiency.

One of the most important projects is a three-year joint demonstration project involving the Japanese New Energy and Industrial Technology Development Organisation (NEDO) together with Hitachi, Mizuho Bank, the Ministry of Economic Development and Technology of the Republic of Slovenia and the Slovenian state-owned electric transmission company ELES to ensure that the energy grid for Idrija using various energy sources will maintain appropriate voltage in the system and reduce power outage time. The project aims to establish a business model to create a market for small- to medium-sized energy distribution companies in verifying and utilizing function that will resolve issues in Slovenia and other EU countries with similar problems by building a EMS (Energy Management System). It will also take advantage of a cost-efficient cloud-based service for the distributing systems of the two electric distribution companies in Slovenia. The municipality of Idrija is a pilot case in this project.

The Municipality is also involved in the Smart-Building, Smart-Grid, Smart-City Project (3Smart) which received funding from Interreg Danube programme. The main objective of the 3Smart Project is to provide a technological and legislative setup for cross-spanning energy management of buildings, grids and major city infrastructures in the Danube region. It will provide optimal economical value to energy-efficiency and renewable energy (EE&RE) investment in the building and optimized costs on the grid side as well as motivate the installation of distributed storages for improving energy security. Within the project a modular software tool for energy management of buildings and the distribution grid is being developed. A strategy to enable city-wide energy management will be prepared in five pilot areas including Idrija.

The Municipality has already demonstrated its interest and competence to be part of innovative and research-oriented consortiums and is already part of several projects, such as those submitted to the Horizon 2020 calls.

In the past, the Municipality of Idrija was part of consortiums that submitted the SmileAlps Project (using Idrija's mine water for power generation); the BUDDY Project (using technologies to enable people with sensory and intellectual disabilities to intuitively interact within media rich social community services); and the SEPH Project (development of nanofabricated sensors for reliable measurements of environmental pollutants – e.g. mercury, radon).

UNESCO designation

In 2012 Idrija achieved another milestone. Idrija, together with Almadén (Spain) was listed on the UNESCO World Heritage List based on the fact that the two towns were the locations of the world's most important mercury mines. They were also historically connected and together they maintained the unique and diversified industrial and technical heritage relevant to mercury mining and mercury production. The designation also recognises the innovations in mining developed in Idrija over a period of 500 years such as different technical and technological improvements in the mine and smelting plant.

But Idrija didn't just make it to UNESCO World Heritage List, it is now also on the List of UNESCO Global Geoparks.

Idrija UNESCO Global Geopark places great emphasis on raising awareness among the younger generations on the importance of its natural heritage. The Global Geoparks Network – GGN is a nongovernmental, non-profit and voluntary network supporting cooperation among geoparks that operates in line with UNESCO's rules on the protection and conservation of world heritage.

[Geopark Idrija](#) does not only promote the richness of the city's geological and other natural heritage, but also its cultural heritage such as traditional cuisine, domestic arts and crafts.



PHOTO 1: GEWERKENEGG CASTLE - BUILT AS THE ADMINISTRATIVE BUILDING OF THE IDRİJA MERCURY MINE (AUTHOR: DUNJA WEDAM)

Alpine Town of the Year Award

In 2011 Idrija was awarded the title of "Alpine Town of the Year" for its commitment to climate protections. Idrija continues to develop projects such as farmers' markets with local organic produce as well as working on local energy supply concepts involving renewables to cut its CO² emissions and expanding the cycle paths to help promoting ecotourism. Idrija was only the second Slovenian town receiving this prestigious award.

C. Idrija's history of innovation and globalisation

Mercury mining

Idrija is Slovenia's oldest mining town and was the second largest mercury mine in the world after the mine in Almadén, Spain. For more than five centuries, the town grew alongside the development and

expansion of the mine below it. Today, the buildings and streets in Idrija tell us stories about those developments and of the people who lived and worked in the town over decades and centuries - their attitude towards the environment, culture and education. The knowledge and experience from the past era have helped contemporary industry to arise and progress, for cultural tourism to grow, and for the town to change its external appearance.

The mining history in Idrija starts in 1490 with the discovery of mercury in the local hills along the Idrijca river. Legend has it that native mercury was discovered by a tub-maker Škafar while cleaning a newly made tub in a brook. But the extended mining in Idrija began with the discovery of rich cinnabar ore in 1508. The Idrija settlement began to develop at the beginning of the 16th Century directly alongside mine piles and devices. By 1580 all mining operations were taken over by the Habsburg Monarchy and later on, the mine was also under Italian, Austrian, French and Yugoslavian rule until 1991 when the Republic of Slovenia took it over. Mercury production continued without interruption from 1508 up to 1977. In the late 1970's the mine had 830 employees, but there was already a big drop in the price of mercury – from 600-800 USD per flask in early 1960's to 100 USD per flask in 1970's. Mining became economically unsustainable. Because of the dependence of inhabitants on the work provided by the mine, a crisis for the local economy was unavoidable.

In 1977 the Management of the Mine together with the Municipality of Idrija, Banks and the Executive Council of the Socialist Republic of Slovenia decided on a number of important measures to address the crisis. One was the temporary cessation of mercury production followed by a rehabilitation programme for the Idrija Mine. Another was to find various contractual works for the group of miners. There were some efforts to remunerate older and disabled workers. A professional core of workers for the maintenance and conservation of the mine was established. Funds for investments in the development of small local factories in Idrija were provided and with the support of Slovenian banks, 15 industrial facilities were constructed or modernized.

Also in 1977 the Act on the Provision of Miners' Social Security and the further development of the Municipality of Idrija was adopted. In 1979 a second Act was adopted which included co-financing from the national budget to maintain the mine for social importance. From year 1983 to 1995 there was just a minimal production of mercury which stopped in November 1995.

But all those years of mining in Idrija of course caused severe pollution in Idrija and its surroundings. In 1995, following the closure of the mine, systematic monitoring of mercury pollution started in Idrija region.

With knowledge and quick measures Idrija made steps ahead instead of backwards. The impact of the closure of the mine could have been terrifying for miners, their families and the town – but the authorities and key stakeholders worked together and handled it well and made Idrija even better. They took advantage of the crisis to make an important shift for a better future.

After the closure of the mine, the main activities connected to mining was towards rehabilitation of mining losses, eliminating the effects of mining activities on the health of former miners and maintaining of the unflooded part of the pit and the monitoring of the affected area of the Idrija Mercury Mine. In 2009 the Slovenian Government decided to liquidate Idrija Mercury Mine and two years later the Government established the Idrija Mercury Heritage Management Centre (CUDHg Idrija) in order to preserve the mining, technical, natural heritage and traditions. Since the shutdown works in the mine have been completed, the company Idrija Mercury Mine ceased to exist in 2017 and

its activities passed to CUDHg Idrija. Role of CUDHg is to maintain part of the Mine's heritage in Idrija as well as to maintain the unflooded part of the mine and to monitor the consequences of 500-year mining in influenced area.

Health research on mercury

500 years of mining and smelting processes resulted in the increased contents of mercury in the soil and rivers, causing severe pollution and contamination with mercury in Idrija and its surroundings.

Although mercury is present in Idrija region mostly in inorganic forms, researchers are aware that biochemical transformation processes and accumulations along food chains can transform mercury into much more toxic organic compounds. Numerous studies were performed in Idrija to examine the transfer and transformation processes of different mercury compounds. The results of these environmental studies have served as a basis in preparing long term rehabilitation measures to reduce the negative accumulated effects of mining activities. The primary strategic goals of the Municipal Environmental Protection Programme (February 2009) included the setup of an effective environmental management system (ISO 14001), reduction of environmental pollution, regulation of public utility infrastructure, waste management, sustainable use of energy, protection of natural resources and biotic diversity, as well as raising environmental awareness and informing citizens.

Although the global population was regularly exposed to methyl mercury - a highly toxic organic compound - through food (consuming fish) and to elemental mercury from dental amalgam fillings, in Idrija and other contaminated sites, people were also exposed to mercury through inhalation of contaminated ambient air.

EU STRATEGY FOR MERCURY (2005)

Owing to the negative effects of mercury on ecosystems, wildlife and humans, a Strategy for Mercury was adopted in the European Community in 2005. In Slovenia we have understood the adoption of this strategy as an opportunity to offer the world the knowledge we have developed over half a century. Now integrated into the European environment, Idrija is able to use its knowledge to tackle new challenges, particularly for the rehabilitation of degraded areas to find the best solutions for inhabitants and the environment.

MINAMATA CONVENTION (2013)

In view of the ongoing international activities to implement the United Nations' [Minamata Convention on Mercury](#), it is of great importance for Municipality of Idrija to improve the population's awareness of mercury-related risks and knowledge on mercury-related issues. Slovenia signed the Minamata Convention in 2013 in Kumamoto, Japan and ratified it in 2017. The Idrija Mercury Heritage Management Centre today plays an important role to help cities manage health information on Mercury.

Industrial diversification

The changes in the composition of the local economy with small factories replacing the mine as the new sources for employment was a critical new phase for the development of Idrija. Two of those factories developed into multi-national companies namely Kolektor and Hidria.

Year	No. of Mercury Mine Employees	No. of Kolektor employees
1964	1350	40
1971	1163	
1976	830	
1977	315	500
1980	238	
2016	12	1200

They employ more than 1500 inhabitants from Idrija and neighbouring Cerklje and their presence is the main reason that the unemployment rate in this area is below the national level. Before 1977 the mine had more than 1300 employees. As the number of employees in the mine was descending the number of employees in Kolektor and Hidria was growing. See the graph above.

We could say that Idrija successfully transitioned from a mining town to an industrial town in the second half of the twentieth century.

From 1991 the economy of Idrija was directed towards Europe and despite the collapse of the Yugoslav market it did not suffer any major shocks. The strong reason is that Idrija is home to headquarters of their two homegrown multi-national companies.

As in the past when Idrija was globally important due to its technological advancements and importance of mercury for post-Columbian development, Idrija is slowly retaking its historical position. Yet, this time in ecologically much less invasive and more sustainable way. Idrija has not broken with its past, but innovatively continues with innovation and solidarity.

– Mayor, Bojan Sever

HQ of two homegrown multi-national companies

[Kolektor, transnational company](#), boasts a reputation in highly specialized industrial production in the field of mobility components and systems, power engineering and engineering & technology systems. It operates globally with 30 companies in strategic world markets that employ more than 3000 people.

[Hidria](#) is one of the leading European and global companies in the field of Automotive Technologies and Industrial Technologies. Their products are sold in 55 countries and they employ more than 1800 people in their companies in Slovenia, Germany, Hungary and China.

The growth and innovations of these two companies also means a culture of growth and innovation in Idrija. The two companies are socially responsible and aware of the importance of their presence and impact on the city. Kolektor for example has a vision for the town to become a “municipality of

knowledge” – both thus collaborate well with the Jurij Vega Grammar School in Idrija and regularly invest in local education provision.



PHOTO 2: KOLEKTOR BUILDING - INDUSTRIAL PART OF IDRİJA. (SOURCE: ARCHIVE OF KOLEKTOR)

D. Vision for the Future

Idrija has a tradition of building and retaining knowledge and innovation as evident in its mercury mining heritage, industrial heritage, historical buildings and its cultural practices and artefacts (nurturing its ‘intangible’ heritage). Idrija is located in an area of beautiful nature. All of these are the reasons for its transition for example from mining to industry and now its new focus on diversification and building a smart city.

A smart city is an urban development vision to integrate information and communication technology (ICT) and Internet of things (IoT) technology in a secure fashion to manage a city's assets. These assets include the information systems of local departments, schools, libraries, transportation modes, hospitals, power plants, water supply networks, waste management, law enforcement and other community services.

The vision for Idrija is to become a city that is socially-just, innovative, sustainable, heritage-inspired and specialised. To achieve those goals Idrija has embarked the mission of creating a smart community.

Challenges to provide smart energy and issues of resilience

As mentioned before – Idrija is a project partner in Smart Building - Smart Grid - Smart City Project (3Smart). Main objective of this project is to provide technological and legislative bases and conditions for cross-energy management of buildings, energy networks and major municipal infrastructures in the Danube region.

One of the objectives of the project is to develop a modular platform for coordinated construction and management of the energy distribution grid. This platform will be tested at five locations in five different countries and for Slovenia the chosen location is Idrija.

Becoming a smart city is not so easy and to be part of a developing platform is not so straightforward. There are many challenges that Idrija face as a testbed ranging from technological to economic, social, jurisdictional and even political. Questions that need to be answered include: How to ensure data interoperability, who and under which conditions can data be accessed and especially who owns the data? How to finance existing infrastructure that is becoming obsolete and who is the lead carrier for costs of new investments? Are urban energy systems independent and at which level should these systems be operated? Those are just some of the key questions that needs to be answered and solved in the future. Systems that addresses those questions are all interlinked and only when implemented equally can the final vision of a smart grid be achieved. Those questions are not only to be answered in case of Idrija, but are main challenges of all Smart Grids.

The smart grid called the Smart Community Platform will be the new digital data layer that is an intermediary between the infrastructure and services and enables all the elements to be mirrored in a digital form, on a computer. Consequently, it can be managed remotely, while real-time data could be shared among many stakeholders at the same time.

The key to the Smart Community Platform is that it integrates data, stores real-time data, analyses the data, reports malfunctions, self-optimises the processes, predicts and simulates.

With such a data platform, we can then get applications which are useful for citizens, administrators, urban managers and businesses. The 'centrality' of the integrated data platform thus enables connectivity and transdisciplinary approaches to solve urban problems.

Key partners and role of Idrija as a test bed

The 3Smart Project brings together different partners ranging from institutions, development agencies, municipalities and companies. The lead partner on the project is University of Zagreb Faculty of Electrical Engineering and Computing. Five pilot locations were selected where the developed platform will be installed and tested – Slovenia, Croatia, Austria, Hungary and Bosnia & Herzegovina. In terms of Slovenia, Idrija was chosen as the national testbed. Being a small city with no previous smart city experience, Idrija was perfect to test the platform's performance and to show project outputs in the best way possible. Idrija's school building, sports centre building and local heating are all subject to upgrade and connect to the EMS (energy management system) with the aim to achieve local production and energy self-sufficiency. In addition, various consumption and energy management scenarios will be thus achieved.

To achieve a coordinated energy management system for the buildings in the city as well as a smart distribution grid is never possible without strong cooperation by different stakeholders in the city itself and external stakeholders such as the regional energy agencies, regulatory agencies of ministries, distribution system operators, suppliers and R&D institutions.

But this is just a start – Idrija is now laying the foundations and first results will be visible in next years. With smart projects Idrija is addressing the challenges of key importance and following the newest trends in Europe and worldwide. Municipality of Idrija is getting a lot of attention, also from other Municipalities asking questions and wanting to hear more about learnings. Idrija, once again, is a role model and paving the way for other similar cities.

E. Conclusion: Small cities embracing change and new technologies

As a small city without above average resources, Idrija is an excellent example of a small-town success story. With such a diverse history and high paced diversification, Idrija is showing that small cities can scale up their infrastructure and technological systems to a much higher level.

With smart in mind, where is the limit? For Idrija, the constant innovations in every aspect leads to a confidence and acceptance that there are no boundaries or limits how smart strategies can impact on the city growth and development.

The key for any small city is to have a positive mindset of the citizens and city leaders and their overall readiness to change and advance towards digitalization of all the relevant processes as experienced during these projects. Successful change management and communication is crucial to show people on different levels and positions across various stakeholders that digital changes are in fact needed.

With regular improvements in mind, every city can change their current systems in the direction of digitalization and using smart technologies. Each city will take its own path. There is not a proven recipe that all cities must follow. To find their best route to become smart cities, no matter their size, cities should learn from other cities and should build partnerships with stakeholders at local, national and international level. It is working for Idrija and can work for other small cities too.

Good understanding of what is happening in and around Idrija provides a good basis for a bright future of our municipality. Investments in economy, youth and cross-border networks should return in the form of overall progress and future-proof solutions.

– Mayor, Bojan Sever

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PHOTOS:

Photo 1: Gewerkenegg Castle – built as the administrative building of the Idrija Mercury mine, author: Dunja Wedam.

Photo 2: Kolektor building - industrial part of Idrija, Archive of Kolektor.