

JOINT CIRCULAR ECONOMY STRATEGY

JOINT CIRCULAR ECONOMY STRATEGY:
VARAŽDIN

8 2020





D.T1.2.7: Joint circular economy strategy: Varaždin

A.T1.2 Developing a local circular economy strategy

Issued by:	Partner Nr. 3 – Development agency North-DAN
Reviewed by:	Partner Nr. 5 – APE FVG
Version date:	26.08.2020
Version. Revision	1.1
Circulation	Restricted to Project Partners

Document History

Date	Version	Description of Change
26.08.2020	v. 1.0	Document issued by PP3
26.08.2020	v. 1.1	Document revised by PP5

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1. INTRODUCTION

The Memorandum of Understanding is an agreement that has been signed by regional stakeholder. It identifies the joint objectives and foreseen activities to boost circular economy (CE) initiatives within the framework of the CITYCIRCLE project in Varaždin County. The regional stakeholders' group had been previously identified via the regional mapping "D.T1.1.2 Regional mapping for CE transition - Varaždin," and it was officially established through bilateral and/or plenary meetings as reported in the deliverable "D.T1.2.2 Regional Stakeholders' group - Varaždin".

The circular economy strategy for Varaždin was designed by adopting an interactive and integrational approach that actively involved the stakeholder's group in two dedicated workshops as described in "D.T1.2.11 CE strategy workshops". The workshops were organized in order to share knowledge and ideas, create synergies among key stakeholders, and pursue a bottom-up approach throughout the strategy development process. They were also organized to gain the relevant stakeholders' commitment and acceptance of the objectives, which contributes to the long-term sustainability of the strategy. The strategy is ruled by the provisions set forth in the Memorandum of Understanding signed by the relevant stakeholders. It represents the framework agreement upon which the local hub will be built. That will be described further in the deliverable "D.T1.3.2 Circular economy hubs implemented: Varaždin".

The aforementioned Memorandum is attached to this document. The next paragraphs contain information on the strategy and the context in which it is intended to be applied.

2. SUMMARY

The CITYCIRCLE project aims to bring innovation and sustainable economic growth to peripheral regions within the European Union. This will be achieved via the implementation of CE practices. The project includes 11 project partners from various European countries (Austria, Croatia, Germany, Italy, Slovenia, and Slovakia). The idea behind the project is to combine the efforts of the private sector and the public sector as a means to generate a terrain suitable for the diffusion of circular economy practices. To achieve this, it is necessary to involve stakeholders from different areas, and to do so in accordance with the principles of the quadruple helix. The helix focuses on ways to create collaborations between Public Authorities, Universities, companies, and civil society. The aim of the project is therefore to create the best possible conditions for generating economic growth in the area, resulting from innovation and sustainable development.

3. GENERAL CONTEXT

At the European level, the transition from a linear economy to a circular economy is an absolute priority. This depends on the fact that, not only this will be indispensable for achieving the objectives set for the protection of the environment, but it will also result in competitive advantages in economic terms. Consider the decarbonisation and climate agreements that involve the European Union. We can cite as an example the European Green Deal, which represents a set of policies aimed at making Europe carbon-neutral by 2050. This specific context generates important opportunities for companies and public bodies to invest in new technologies. This makes their activities more competitive on the one hand, and makes cities healthier and hospitable places on the other.

Taking the 17 goals for sustainable development as a guideline, it is clear that for some of them, the circular economy can facilitate their achievement. In the following table (Schroeder et al., 2019), we see what is the relevance and the possible impact of CE for every single SDG (Sustainable Development Goals). The numbers in the boxes represent the number of targets related to the corresponding goal that CE could help to achieve in some way. Sometimes we notice an inverse relationship that represents the cases in which reaching the target could be helpful in order to support CE diffusion. For these types of research, the CE framework can allow us to reach different SDG targets. The total number of targets is 169, and CE seems to directly affect 21 of them. Also, it seems to indirectly affect 28 other targets. With regards to SDGs, SDGs 6, 7, 8, 12 and 15 are the ones for which there exists the strongest link with CE.



	<i>Direct contribution of CE practices to achieve target</i>	<i>Indirect contribution of CE practices to achieve target (e.g., via other SDGs)</i>	<i>Achieving target will contribute toward CE</i>	<i>Weak or no link</i>	<i>Cooperation opportunities for CE promotion</i>
Goal 1	0	4	1	1	1
Goal 2	1	3	3	0	1
Goal 3	1	0	0	11	1
Goal 4	0	0	5	3	2
Goal 5	0	0	2	6	1
Goal 6	4	1	0	0	3
Goal 7	3	1	0	0	1
Goal 8	2	3	4	1	2
Goal 9	2	0	6	0	0
Goal 10	0	1	4	4	1
Goal 11	1	3	3	2	1
Goal 12	3	5	2	0	1
Goal 13	0	1	3	0	1
Goal 14	1	2	3	1	3
Goal 15	3	3	1	1	4
Goal 16	0	1	6	5	0
Goal 17	0	0	9	0	10
Total	21	28	52	35	33

With this in mind, CITYCIRCLE aims to disseminate tools such as industrial symbiosis in order to provide examples of good sustainable development practices that will be able to be repeated by other companies and other organizations. A problem in this regard may be the fact that, especially dealing with peripheral territories, interested parties may find difficulties and barriers on several fronts (Kirchherr et al., 2018), including:

- A) **Cultural:** hesitant company culture, limited willingness to collaborate in the value chain, lacking consumer awareness and interest, etc.
- B) **Regulatory:** limited circular procurement, obstructive laws and regulations, lacking global consensus, etc.
- C) **Technological:** lacking ability to deliver high quality remanufactured products, limited circular designs, too few large-scale demonstration projects, etc.
- D) **Market:** low raw material prices, lacking standardization, high upfront investment costs, etc.

To cope with these problems, CITYCIRCLE provides for the implementation of facilitator offices (hubs) capable of monitoring companies and organizations of various types along the CE transition path.

4. KEY OBJECTIVES OF THE PROJECT

In order to create, as mentioned, a favourable environment for sustainable development, the CITYCIRCLE project will focus on the following objectives:

- 1) **Implementation of pilot projects that will serve as examples for future initiatives:** This will happen as a result of the collaboration with stakeholders and the identification of specific and promising projects.
- 2) **Promotion of the initiative and the concept of circular economy:** through events, web advertising campaigns, etc.



- 3) **Creation of a circular economy (CE) hub in each of the regions identified by the project:** hubs will work as a facilitator office capable of offering services to users and stakeholders that are transitioning to the circular economy.

5. THE STRATEGY FOR VARAZDIN/VARAZDIN COUNTY

In this section, the reader will find content regarding the specific characteristics of the territory in question, the plan for achieving the project objectives contextualized in the region and other information related to the specific context.

5.1. THE DEFINITION OF STAKEHOLDERS

The signatory stakeholders of the Memorandum are willing to implement circular economy practices in their existing business activities. The signatories include the following: *Gumiimpex - GRP d.o.o.*, *Gradska tržnica d.o.o.*, *Socijalna zadruga Humana Nova Čakovec*, *Studentski centar Varaždin*, *Varaždinska župnija*, *Lokvina d.o.o.*, *Tehnološki park Varaždin d.o.o.*, *Čistoća d.o.o.* and *Varkom d.d.* The aforementioned stakeholders together with citizens and academia fall within the quadruple helix model, with an emphasis on increasing the number of stakeholders in CE in the near future.

The City of Varaždin, as the capital city of Varaždin County and a public authority, is willing to give all the support needed to ease the transition towards the circular economy. Based on several meetings and workshops, it has been found that the best option would be to start with the disposal of biodegradable waste, as it makes the largest part of the total amount of produced waste. *Gradska tržnica d.o.o.* is a public utility company that is located in the heart of the City. It serves as a market where people regularly gather to purchase and sell goods. Considering that the city market is considered one of the biggest and important attractions in the City, and that it is visited by a considerable number of people throughout the day, it is a good starting point for the implementation of the circular economy. To meet the goals, the following public utility companies expressed interest in managing biodegradable waste and textiles discarded as waste. *Čistoća d.o.o.* would be in charge of the management of biodegradable waste, while *Socijalna zadruga Humana Nova Čakovec* would be responsible for the considerable number of textiles. *Socijalna zadruga Humana Nova Čakovec* as a social cooperative/enterprise encourages the employment of persons with disabilities and other socially excluded persons. They primarily collect household textiles, but only around 2.5% of the collected textiles can be further used. The collected textiles are marketed through the Croatian Red Cross and via their own second-hand shops. A separate collection process would contribute to the collection of higher quantities of valuable textiles because separately collected textiles are of significantly higher quality than those present in mixed municipal waste. *Čistoća d.o.o.* is a limited liability company for waste management, cleanliness, production and services. The separate collection of waste would help them to reduce operation costs because they would be able to supply the collected biodegradable waste to a nearby biogas plant.

Other manufacturing/service enterprises willing to be involved in CE include *Solvis d.o.o.*, *Tehnix d.o.o.*, *Kircek d.o.o.*, *Derma d.o.o.*, *Pavetić d.o.o.*, *OPG Vrčec* and *Bomark Pak d.o.o.* (expected in the near future). The following paragraph provides a description of the main companies involved in the project as stakeholders.

Gumiimpex - GRP d.o.o. operates in the rubber industry. Its main business is producing, recycling and manufacturing tyres for the local and international markets. *Lokvina d.o.o.* is a company that supports organic producers in the procurement of needed raw materials, primarily seeds. *Solvis d.o.o.* is the largest Croatian manufacturer of solar panels. *Tehnix d.o.o.* is leading the eco-industry regionally. Its main goal is to develop and produce the best technology for achieving sustainable development and a circular economy. *OPG Vrčec* has been boosted by EU good practice examples. It installed a biogas power plant; however, there was an insufficient amount of biodegradable waste and that meant it could not reach its full potential. *Bomark Pak d.o.o.* is the only Croatian producer of stretch films. Even though they have the capacity and technology to recycle the produced and used stretch films, improper disposal of plastic waste represents a serious obstacle to their CE goals.

The aforementioned stakeholders are already familiar with the principles and rules of circular economy and are expected to serve as good examples to other SMEs.



5.2. SPECIFIC OPPORTUNITIES RELATED TO THE TERRITORY

The specific strength related to the City of Varaždin and Varaždin County is its favourable geo-logistic location. The city and county are situated in the far north of Croatia, on both plains and hills. Varaždin County together with Međimurje County connects Western and Central Europe with South-eastern Europe and the Middle East. Furthermore, one of the greatest assets is that the key stakeholders understand the importance of implementing circular economy in the city's business. The positive aspects that will facilitate the transition towards circular economy are the following:

- Infrastructural resources for networking and entrepreneurship support;
- Educational opportunities from preschool all the way to university graduation;
- Local government interest in the development of strategies, projects, and programs;
- Stakeholders are willing to participate in actions and they are aware of the importance of educating civil society;
- There is a significant number of existing craftsmen and entrepreneurs;
- A large number of research and scientific institutions;

Existing business zones and developed industry gives a great perspective for further investment development. Besides that, fertile soil and accessible terrain contribute to sustainable agriculture and environmental protection.

Some of the opportunities expected from the circular economy are:

- Production of fuel based on renewable resources;
- Strengthening the city's competitiveness;
- Contribution to local, regional and state administration in achieving the goals set by the EU;
- Free trade and access to the EU market;
- Retaining a young, educated population in the Varazdin area;
- Reduced waste disposal;
- Sustainable management of public urban areas;
- Opportunities for economic growth;
- Sustainable consumer behaviour and employment opportunities;

5.3. SPECIFIC CHALLENGES RELATED TO THE TERRITORY

Despite the fact that the implementation of circular economy in businesses has many advantages, the lack of investment funds largely hinders the transition from the linear to circular economy. Besides that, most investors are afraid of risk, failure, and changing current habits and existing workflows. A lot of persistence and patience is required in order to develop conditions for a safer and better working and living environment.

Government and local authorities also have a significant role in implementing the circular economy. The lack of incentives often hampers further development, as well as the lack of funds. One of the major obstacles that the City is faced with is the lack of funding sources and an existing legislative framework. The proximity of Zagreb, the capital city of the Republic of Croatia, is both an advantage and a flaw; mainly because of the possible emigration of young people from the Varazdin area.

5.4. CONTEXTUALIZATION OF THE PROJECT OBJECTIVES

Within the framework of the CITYCIRCLE project, the circular economy strategy of the City of Varaždin will be mainly focused on the implementation of defined key objectives. During the workshops and meetings, held primarily in favour of the circular economy strategy, stakeholders agreed on the implementation of the pilot project at the city market *Gradska Tržnica d.o.o.* in the City of Varaždin. It seemed to be the best option due to the fact it gathers a lot of people/customers throughout the day. For that reason, the potential of circular economy will be tested initially on a



smaller scale. If it then proves achievable, it will be extended on a larger scale. Over a period of 24 months, all types of waste from the city market will be sorted, collected, and properly treated. The emphasis will be on biodegradable waste, which will be treated in a biogas plant, while the produced digestate (biproduct) will be used on a hazelnut farm owned by the city market. The defined pilot project will serve to boost the innovation potential of the circular economy, and it will be considered as a means for testing tools and guidelines given by the CITYCIRCLE project. Besides that, the pilot project will serve as a means for the identification of possible problems, and will enable necessary changes and adjustments. Nevertheless, it is necessary to emphasize that the project will not include measured economic performance during the implementation phase. It is expected though that it will serve as a precondition and catalyst for future activities.

To achieve the successful implementation of the pilot project, quality education and educational materials will be of great importance. The main goal is to educate the public and business sector through education and workshops about the benefits of the circular economy. It will provide a clear introduction to all future events related to the circular economy. Furthermore, the implementation of the circular economy in the City of Varaždin will enable the creation of a regional hub for the circular economy that could find solutions for the disposal of waste streams from various industrial areas. The aim within the project is to provide all the materials needed for the promotion and implementation of circular economy such as guidelines, presentations of business models, posters, leaflets, etc. By looking at waste as a valuable raw material, it is possible to close the circle and introduce the transition from linear to circular economy. This is the main ambition of all stakeholders - to contribute to better waste management by introducing circular economy into their businesses. For this purpose, a regional interest group has been established that will provide long-term engagement and collaborative leadership.

5.5. SCHEDULED ACTIVITIES

Prior to defining strategic goals and priorities, a SWOT (*strengths, weaknesses, opportunities and threats*) analysis was conducted. In section 5.2., specific opportunities and strengths are described in more detail. Challenges, i.e. weaknesses and threats, are described in section 5.3.

In order to establish the visibility of the transition process towards full circularity in cities, there is a need to replace existing structures with new social and institutional structures. Due to the fact that the transition process can take a long time (in some cases it takes several decades), most of the targets are set for the period 2020 - 2030. Table 1 gives an overview of the strategic goals, priorities, and measures.

Table 1. Strategic goals, priorities, and measures

Strategic goals - SG	Priorities- P	Measures - M
SG1 Modernization of the municipal waste management system	P1 Legal framework and an enabling financial environment	M1 Regulation on the price for the collection of mixed municipal waste and recyclable waste
	P2 Infrastructure for the collection and treatment of waste	M1 Construction of another recycling yard
		M2 Construction and equipping of the sorting plant
	P3 Separate collection of useful and usable waste	M1 Continuous education of the population on the proper waste separation processes



Strategic goals - SG	Priorities- P	Measures - M
		M2 Secure enough bins for waste separation
		M3 Demonstration of a pilot project within the EU project CITYCIRCLE
		M4 Procurement of vehicles for separate waste collection and the emptying of underground tanks
	P4 Disposal of biodegradable waste	M1 Anaerobic treatment of biodegradable waste
	P5 Long-term establishment of an exchange network where waste is used as a secondary high-quality raw material	M1 Establishment of a waste supply and demand system ('waste exchange')
SG2 Efficient water management	P1 Wastewater reuse	M1 Reuse of treated wastewater in accordance with the quality requirements, depending on the purpose of use of the treated water
		M2 Sludge disposal problem solved
	P2 Rainwater harvesting	M1 Promoting the installation of a rainwater harvesting system
	P3 Risk management	M1 Defining all risks related to sustainable wastewater management
SG3 Efficient construction material management	P1 Conversion of used construction material into secondary raw material	M1 Improved on-site waste identification
		M2 Defining waste management procedures
	P2 Improved waste logistics	M1 Traceability of waste streams
	P3 Development of construction waste treatment capacity	M1 Construction of a recycling yard for construction waste
	P4 Maintaining the quality of construction waste	M1 Construction waste quality management
SG4 Energy management	P1 Development of a sustainable transport system	M1 Development of a legislative and financial model



Strategic goals - SG	Priorities- P	Measures - M
	P2 Promotion of energy efficiency	M1 Investing in the renovation of existing buildings
		M2 Investing in solar power plants
		M3 Production and use of biomethane
		M5 Getting energy from biomass
		M6 Introduction of smart energy networks
SG5 Circular procurement of materials	P1 Green public procurement	M1 Buying green products
SG6 Investing in entrepreneurship	P1 A stimulating entrepreneurial environment	M1 Conversion of neglected industrial facilities into functional facilities
		M2 Introduction of incentive measures for entrepreneurs and craftsmen
		M3 Intensive networking and cooperation of entrepreneurs as well as knowledge transfer in all directions
		M4 Educating entrepreneurs about the importance of investing in innovative technologies and services, i.e. in the circular economy

SG1 Modernization of the municipal waste management system

Due to the fact environmental problems associated with the generation and treatment of waste are deeply rooted in all parts of society, the first goal is dedicated to the waste management system. It is expected that the modernization of the municipal waste management system will lead to a significant number of benefits for the City and its population. According to the Waste Management Plan of the Republic of Croatia for the period 2017 - 2022, a slight increase in the amount of municipal waste is expected by 2030, with the production of about 2 million tons of municipal waste. In order to stop the rising tendency, increase the degree of separate collection and recycling, and reduce the share of biodegradable waste, the waste hierarchy will serve as the backbone of all future activities related to municipal waste treatment. According to the waste management hierarchy, the most desirable option is to avoid the generation of waste, and if it already occurs, it is desirable to reuse it. The next option is recycling, and after that, energy recovery. Waste disposal is the least desirable option. It is expected that by 2025 much lower quantities of waste will be disposed at landfills. Ultimately, the goal is to reach and implement the main concept of circular economy - to minimize or eliminate waste and to implement value chain management wherever and whenever possible.



Expected results:

- More than 70% of municipal waste collected separately;
- A total of two recycling yards in the City of Varaždin by the end of 2025;
- Lowered transport costs of the remaining mixed municipal waste to the Regional Centre for Waste Management ("Piškornica" d.o.o.) in the Municipality of Koprivnički Ivanec; at the same time, there will be a less negative impact on the environment, and lower costs for citizens;
- Contribution to the achievement of strategic goals in the sector of sustainable waste management at the local level;
- Obtaining cleaner raw materials of much higher value and quality, which ultimately leads to final products of better quality;
- All produced biogas and digestate used in the city of Varaždin - biogas as fuel for public transport and digestate as a valuable fertilizer on agricultural land;
- More than 70% of waste streams converted into secondary raw materials.

SG2 Efficient water management

The second goal is dedicated to water collection and reuse. Municipal wastewater treatment plants can play an important role in helping cities toward a sustainable future, i.e. via the circular flow of water, waste, material and energy. Water shortages have been growing in some parts of the European Union over the last few decades, leaving a detrimental effect on our environment and economy. The application of the principles of circular economy in water management is an important step in mitigating and preventing the global water crisis. One way to alleviate pressure on water resources in the EU is to reuse treated wastewater. According to the United Nations, almost half of the world's population could face the effects of water stress by 2030. In order to avoid this, integrated water management of all available water resources (surface, groundwater, wastewater and treated water) is needed, as well as adequate management of water-related risks. Even though the Republic of Croatia possesses significant reserves of drinking water (5th place in Europe and 42nd place in the world, according to a survey from UNESCO, 2013), it is obliged to follow examples of good practice and encourage its efficient use. After the European Commission adopted the Proposal for a Regulation on minimum requirements for water reuse as part of the implementation of the EU Action Plan for the Circular Economy, the Government of the Republic of Croatia set the goal of irrigating 6% of arable agricultural land by 2020. The Municipal Wastewater Treatment Directive (91/271/EEC) currently regulates the collection, treatment and discharge of municipal wastewater and the treatment and discharge of water from certain industrial sectors. In addition, the Directive clearly states that treated wastewater will be reused whenever possible. By applying the principles of circular economy, we are one step closer to future practices that will be necessary in facing future challenges in water management, such as increased demand and increasingly strict regulation in achieving the best possible quality of wastewater.

Expected results:

- Complete (100%) disposal of wastewater and polluted rainwater with a quality sewer system, treatment system and acceptable methods of disposal;
- Fully educated and aware population about the importance of rational water consumption and the possibilities of its reuse;
- Completely solved problem of sludge disposal in the City of Varaždin;
- More than 40% of treated sludge used on agricultural land;
- Through a system of rainwater collection, 30% of totally required water savings will be achieved;
- Complete (100%) avoidance of all hazards related to wastewater treatment and management.

SG3 Efficient construction material management

The third goal addresses the problem of converting used construction material into secondary raw materials in construction. Occupying almost one third of the total waste generated in the European Union, construction and demolition waste accounts for the largest waste stream. According to the Industrial Strategy of the Republic of Croatia, the continuous growth of construction waste is expected and the total amount of construction waste will amount to more than 4500 tons by 2022. According to the Ministry of Environment and Energy (Institute for Environmental Protection and



Nature), who issued a Review of the data on construction waste management in 2018, the recovery rate of construction waste in the Republic of Croatia in 2018 was 58%.

Expected results:

- Sorting of construction waste at the place of origin is expected to reduce transportation costs (by more than 50%) because only valuable and usable material would be taken to the recycling yard;
- An increased share of recycled construction waste in the CE area - amounting to more than 50 %;
- Predefined demolition steps for easier demolition and separation of valuable materials;
- Lower transportation costs (by more than 50%) of construction waste to the transshipment station or recycling yard;
- Reduced fuel consumption during transport;
- Reduced CO₂ emissions;
- Recycling yard for construction waste established by 2023;
- Recycled construction material of high quality.

SG4 Energy management

Most European and national documents consider climate change mitigation to be a priority. One of the ways to mitigate current changes is through the efficient use and management of energy. The City of Varaždin is on the right track, and that was confirmed by its accession to one of the most successful initiatives in the field of energy efficiency under the European Commission - the Covenant of Mayors. The City has thus committed itself to introduce a number of measures, whereby in 2020 the share of energy from renewable sources in gross direct consumption should be at least 20%. According to the latest plan, the goal is to achieve at least 32% by 2030.

Climate change mitigation is a priority of mentioned in most European and national documents, and one of the ways to achieve this is by increasing energy efficiency and making better use of renewable energy sources. A large number of European projects can be used to withdraw EU funds as a means to promote renewable energy sources and encourage more efficient energy use and management.

Expected results:

- Increased awareness among citizens about efficient energy use, reduced energy consumption, and increased share of energy use from renewable sources;
- CO₂ emissions from the construction sector are expected to be reduced by 80 - 95% by 2050;
- Increased share of electricity obtained from renewable sources;
- 40% of public transport vehicles using biomethane as fuel;
- 10% reduction in CO₂ emissions in the transport sector;
- Active cooperation between the scientific and economic/business sector;
- Achieved savings of at least 15% in energy consumption in the field of CE by introducing smart energy networks.

SG5 Circular procurement of materials

By purchasing green products that have a lower environmental impact over their lifetime than those that they would otherwise procure, public bodies can greatly influence sustainable production and consumption, and can contribute to reducing resource consumption, greenhouse gas emissions and CO₂ emissions. Therefore, the fifth goal is related to the circular procurement of materials through green public procurement. In EU countries, more than 25% of the total number of employees work in the public sector, while each year more than 250,000 public bodies spend about 17% of the EU's GDP on the purchase of goods, works and services. According to the data of the Statistical Report on Public Procurement in the Republic of Croatia for 2018, the share of the total value of public procurement excluding value-added tax (VAT) in GDP for 2018 is 14.88%. This clearly shows the key role of public procurement in the implementation of the circular economy, which is by definition a procedure in which public administration bodies procure goods, works and services that during their lifetime have less impact on the environment than goods, works and services with the same basic function.



Expected results:

- Inclusion of green public procurement criteria in more than 80% of public procurement procedures.

SG6 Investing in entrepreneurship

The transition to a circular economy requires a lot of changes throughout the value chain. Innovation plays a key role in the development of new ideas, services and solutions. This was agreed on by the majority of participants at the workshops that were held for the development of the Strategy. Hence, investing in innovation and the opening of new entrepreneurial zones will be of great importance for the implementation of the circular economy. Supporting research and innovation is a key factor that will contribute to transforming waste into high-value products as well as finding new technologies, processes, services and business models that will shape the future of the economy and society.

Expected results:

- Contribution to the long-term reduction of structural unemployment due to the development of appropriate competencies;
- Increased number of participants in educational workshops.

5.6. THE ECONOMIC SUSTAINABILITY OF THE HUB

The concept of circular economy is a major driver of sustainable development. Because the circular economy as a concept is still unknown to many entrepreneurs, it is often perceived as too complex to implement. Most stakeholders and companies do not see the benefits of its application within their business activities and social communities. The basis for the achievement of the circular economy presupposes the application of a quadruple-helix model that includes stakeholders from the public sector, private sector, academia, and civil society. Given that the process of transition to a sustainable society will take one or two decades (at least) it will be necessary to make efforts to educate all stakeholders, discover new methods and processes of production and design, as well as establish the waste market.

The establishment of the hub for the circular economy will enable a faster operationalization of the vision of the circular economy of the City of Varaždin. For stakeholders from all groups of the quadruple helix model, a hub provides a common basis for designing best practices to be used in supply and value chains. The hub will have a multiple role. It will be a place of support that is open to all participants. Through workshops, it will provide education on waste management opportunities, encourage the involvement of the scientific community in finding new solutions, and it will guide entrepreneurs to apply the concept of circular economy to their businesses.

The hub's focus will therefore be to facilitate:

- The introduction of best practices for implementing the circular economy concept;
- Development and research of new technologies and production processes;
- Establishment of markets for waste, tools and waste processing equipment, and related services.

Initially, the hub will serve as an educational tool that will facilitate the building of a community interested in the circular economy. Over time, the hub should grow into a research and development facility that identifies waste streams and serves as a field laboratory for local and regional stakeholders. In this regard, public companies can play a prominent role in the construction of facilities that, in real conditions, can demonstrate the principles and benefits of applying the concept of circular economy. In essence, such facilities will serve as a testing ground for new technologies.

The hub's activities will be supported by a digital platform that will initially take the form of a website that provides quick access to the materials and tools needed to facilitate the introduction of the circular economy concept. In the next phase of development, the platform will be improved with content related to the application of technologies, production processes and best practices, and will make available a database with all waste streams and existing possibilities for its disposal and/or new application.



The hub will conduct its work on a non-commercial basis. The model relating to its economic sustainability needs to be defined in order for it to remain operational and capable of providing continuous support to the economy. This needs to be done during the project.

There are several models available to achieve economic sustainability, which could be used simultaneously to maximize the impact on the local economy. The work of the hub will be greatly influenced by all PESTLE (P - political, E - economic, S - social, T - technological, L - legal, and E - environmental) areas, which will largely determine the types of funding sources. Possible sources of funding are: European Union and Member State funds, local governments, public and private sources of funding, as well as the use of crowdfunding or similar programs.

In addition to operationalizing the vision of the Circular Economy Strategy of the City of Varaždin, the goal of the hub is to increase the competitiveness of the local and regional economy. Sustainable development and the circular economy bring many opportunities to entrepreneurs, but the concept and corresponding legislation can pose a challenge. To keep the region competitive, entrepreneurs need support and access to information, best practices, and the latest technologies for resource management, especially those that will enable them to turn waste into a valuable resource.

6. ANNEX

- Memorandum of Understanding signed by the stakeholders (English version);
- Memorandum of Understanding signed by the stakeholders (National language/Croatian version).