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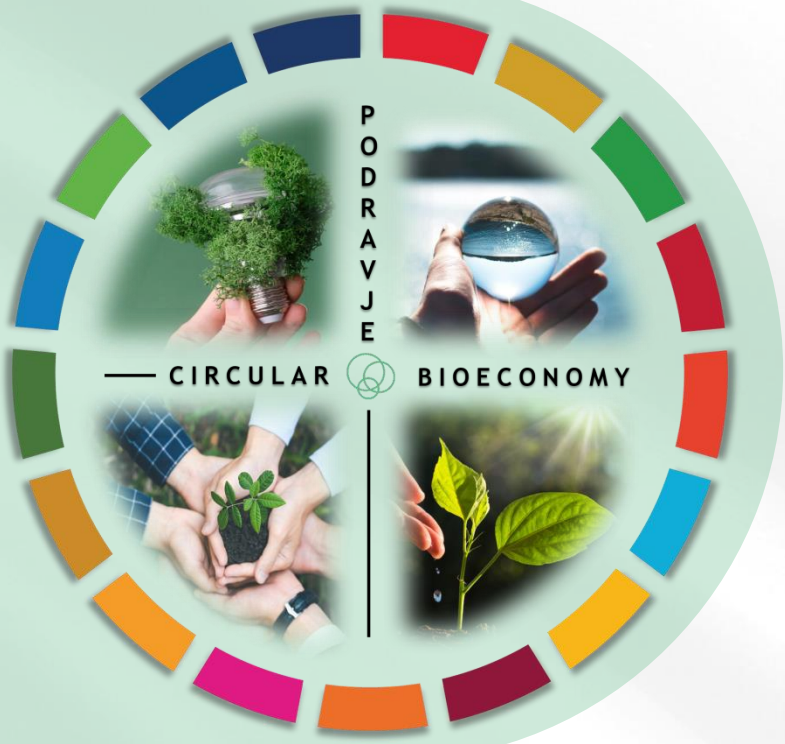

Action Plan for Implementation of the CCRI Regional Strategy for the transition to a Circular Bioeconomy

PODRAVJE 2025 - 2030

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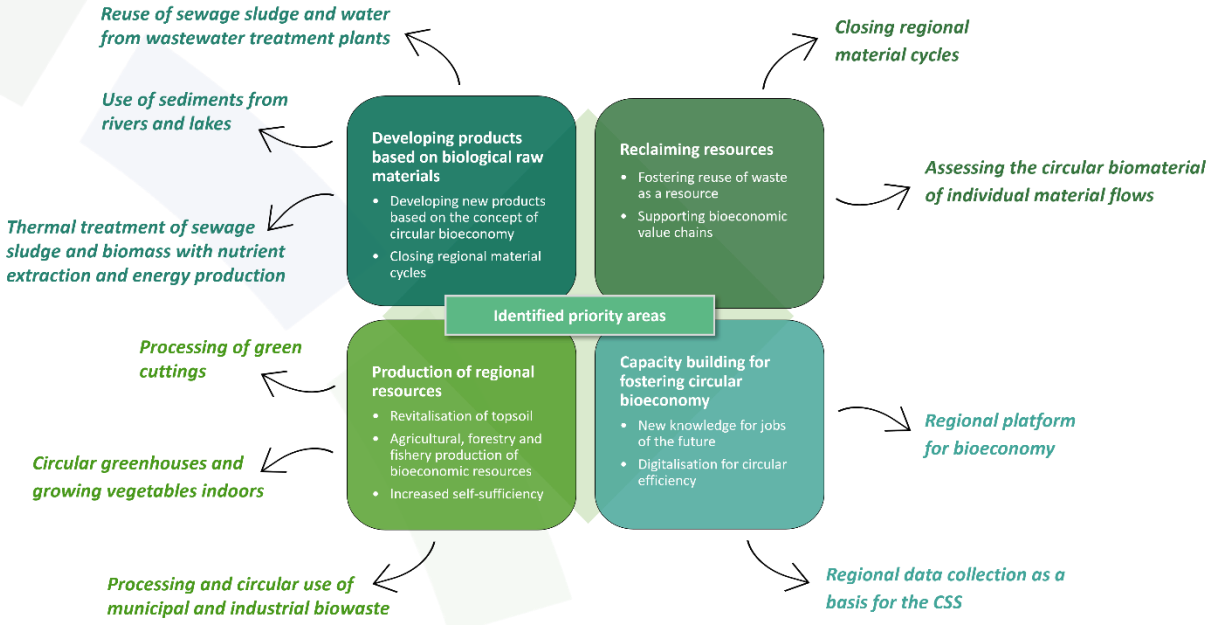
1 Introduction

In December 2023, the Regional Council of Podravje accepted the proposed Strategy for the Transition to a Circular Bioeconomy. Within the strategy, four main priority areas were identified.

For each of the four priority areas, various Circular Systemic Solutions[1] (CSS) have been proposed. Their implementation is the basis for achieving the transition to a circular bioeconomy within the Podravje region.

There were originally 12 proposed CSSs identified; however, during consultations with stakeholders, it became obvious that certain areas are similar enough to be joined into single solutions.

Each of the 10 proposed CSSs offers the possibility of implementation of various demonstration or test projects to achieve a complete systemic solution in the region.



Ten Circular Systemic Solutions for the Podravje Region

[1] *According to the Circular Cities and Regions Initiative (CCRI), a circular systemic solution (CSS) is a demonstration project that aims to deploy a circular and climate-neutral economy at an urban or regional scale. These solutions go beyond individual initiatives and instead focus on addressing the root causes of resource inefficiency and waste generation.*

2 Definition of the Problem

The statistical region of Podravje covers the area of 2,170 km^2 (10.7% of the Slovenian territory) and has 327,577 inhabitants (15.55% of the Slovenian population), with a population density of 151 (145% of the national average). It is the fifth largest and the second most populated region. However, with an innovation index of 84.9, it is lagging behind the national average of 95.1, and especially behind western regions with an index of 105.4.

The strategy identifies the following general challenges for the region:

- In terms of economic activity, the region is below average, as its GDP per capita is only 82% of the average Slovenian GDP, ranking Podravje eighth (out of 12) among Slovenian regions[2].
- According to the Development Threat Index (Slovenia, 2019), Podravje is considered an underdeveloped region, ranking tenth out of 12.
- Low investments in fixed assets. Gross fixed capital formation relative to regional GDP has been the lowest among Slovenian regions for many years.
- Compared to other regions and the Slovenian average, the share of funds for research and development is also low, with Podravje ranking sixth (out of 12 regions) in terms of the amount of funds allocated to research and development[3].
- Lack of jobs in the market, with additional migration (daily and permanent) of skilled workers, with over 18% of the active working population employed outside the region[4].
- High unemployment (especially among young people) and an aging population, with Podravje having the third highest unemployment rate (out of 12 Slovenian regions)[5].
- Lack of political support and a systemic approach to circular economy in the region to develop encompassing regional CE policies, regulation, and funding schemes.

[2] https://pxweb.stat.si/SiStatData/pxweb/sl/Data/-/0309250S.px/table/tableViewLayout2/ (SURS)
[3] https://pxweb.stat.si/SiStatData/pxweb/sl/Data/-/2364245S.px/table/tableViewLayout2/ (SURS)
[4] https://pxweb.stat.si/SiStatData/pxweb/sl/Data/-/0723405S.px/table/tableViewLayout2/ (SURS)
[5] https://pxweb.stat.si/SiStatData/pxweb/sl/Data/-/0762115S.px (SURS)

More specific challenges in the field of circular bioeconomy have also been identified:

- The region has a low level of local self-sufficiency (especially in fruit and vegetable production).
- Lack of knowledge about the potential of the region's natural resources and how they could be exploited.
- The poor condition/quality of agricultural soils due to intensive farming (use of artificial fertilisers, pesticides, etc.) on agricultural land in the past is slowly improving. As a result of this, as well as drought periods, some areas in the region (e.g. the Ptujsko polje) have regularly faced the problem of groundwater pollution.
- Poor management of organic waste, especially sewage sludge, but also low-quality wood biomass and agricultural waste, which can be the basis for organic waste processing and pyrolysis.
- Poor use of waste heat (industry, hydropower, organic matter).
- Management of water sediments (hydropower reservoirs, lakes, and reservoirs).
- Lack of awareness and knowledge of the circular economy in general and of the circular bioeconomy in particular among all stakeholder groups (including public, private, and citizens).
- Lack of knowledge on how to set up financial instruments to support the implementation of circular actions and activities in the field.
- Lack of knowledge on green public procurement and how it can be used by the public sector to promote circular products and services in general and in the bioeconomy sector in particular.

The following challenges are addressed through the proposed CSSs.

The main objective of the Podravje region is to support the development of a climate-resilient and circular regional bioeconomy through the utilisation of endogenous regional bioeconomy potentials and to initiate the formation of value chains derived from available biodegradable materials.

3 Proposed Circular Systemic Solutions

With 10 different CSSs proposed, the region applied the following matrix to define the priorities:

EFFECT	SCOPE	IMPACT	SUCCESS	COST	IMPLEMENTATION READINESS
Short-term	Regional	High	High probability	Low cost	Ready
Long-term	Local	Low	Low probability	High cost	Not ready

The green boxes increase the CSS priority and the orange ones decrease it.

The matrix was used to rank the identified CSSs into three priority levels:

- Starts before 2026
- Starts before 2028
- Starts after 2028

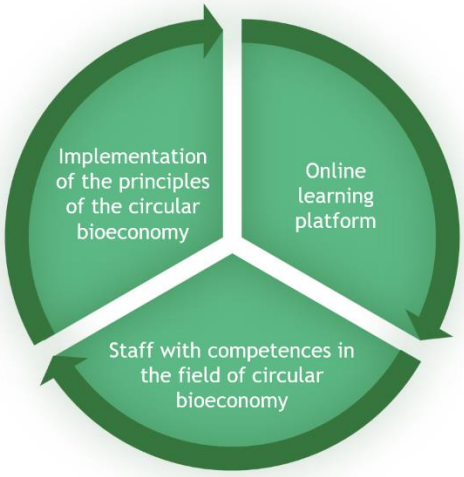
With each CSS, however, the start of implementation depends on the resources needed and the funding secured, thus the implementation may fall behind schedule, if adequate funding (private funding, PPP, public funding – local, regional, national or international) is not secured.

Here is the breakdown of each CSS:

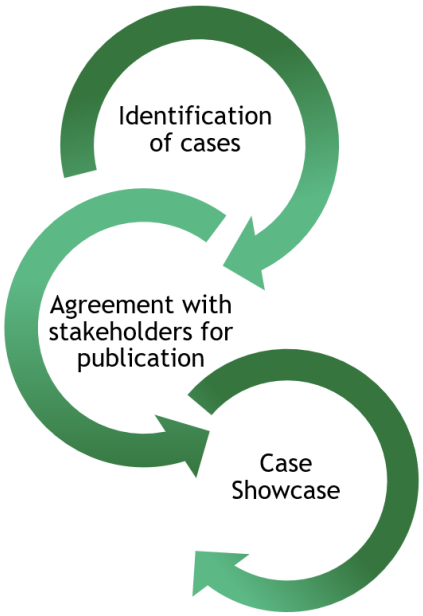
1. Regional platform for bioeconomy
2. Regional data collection as a basis for the CSS
3. Closing regional material cycles
4. Circular greenhouses and growing vegetables indoors
5. Reuse of sewage sludge and water from wastewater treatment plants
6. Processing and circular use of municipal and industrial biowaste
7. Use of sediments from rivers and lakes
8. Processing of green cuttings
9. Thermal treatment of sewage sludge and biomass with nutrient extraction and energy production
10. Assessing the circular biomaterial of individual material flows

3.1 Regional platform for bioeconomy

Competence building:



Awareness-raising:



Description

Regional platform: RDA Podravje – Maribor and E-Institute will collect examples of good practices in the field of circular bioeconomy in regular cooperation with stakeholders in the region and in international networks and acquire new knowledge, which will be presented once a year in the context of a dissemination event for the exchange of knowledge and good practices. The event will be organised in the format of a regional development conference or other professional event dedicated to regional stakeholders of the green transition.

Competence building: RDA Podravje – Maribor will develop a curriculum for the promotion of circular bioeconomy based on the industrial symbiosis approach. The programme will be designed for non-formal education, but will be based on a study module approach, which can earn credits for the student if the public education programme includes it as part of its curriculum.

Furthermore, the programme will aim to enhance competences both in identifying opportunities for bio-regional integration and in managing the process of bio-regional cooperation between different producers.

The training programme will be offered free of charge as part of self-study and will provide participants with the knowledge, skills, and competences to manage circular bioeconomy processes in the region.

Awareness-raising: As part of its regular communication tasks with the public, RDA Podravje – Maribor will present regional achievements in the field of green transition, both within its own activities and those of other circular bioeconomy stakeholders in the region. To this end, stakeholders who independently take care of their own promotion of activities and achievements in the field of circular bioeconomy or other aspects of the green transition will be further highlighted, as their achievements will also be presented in the context of the promotion of the green transition by the RDA Podravje – Maribor. This will increase the outreach and impact on raising awareness of the general public on circular bioeconomy issues.

Resources and prerequisites

Regional platform: a thematic link to a regional development conference or other professional event, where good practices and new knowledge in the field of bioeconomy will be presented once a year.

Competence building: an online platform with learning content and a self-assessment test in Slovenian, funded by EU funding from RDA Podravje – Maribor and the INSET partnership.

Awareness-raising: RDA Podravje – Maribor will collect regional achievements in the field of green transition and circular bioeconomy. It will further showcase them through its own communication channels or highlight those stakeholder communication channels where achievements are already being showcased.

Stakeholders

Regional platform:
RDA Podravje – Maribor: annual co-organiser of the Sedlar Meeting (scientific conference) and coordinator of the Regional Development Network (RDN).

RDN: provides development initiatives, brings together stakeholders in the preparation and implementation of regional projects, ensures the exchange of information among the involved institutions on programmes and projects in the region, and connects development institutions in the region.

Council of the Podravje Region: the highest regional body promoting the harmonious development of the region. It comprises mayors of all municipalities in the region. The Council adopts the Regional Development Programme (RDP) and approves its implementation plan.

E-Institute: is responsible for improving the quality of life in the region in close connection with sustainable development.

University of Maribor: develops and disseminates new knowledge through an interdisciplinary approach.

Chamber of Commerce and Industry of Štajerska: representative of the interests of economic operators in the region and promoter of the SRIP Circular Economy.

Chambers of Craft and Small Businesses – representations in the region: adaptation of craftsmen, small and medium enterprises to the green transition.

Javni holding Maribor d.o.o. (public service company) and other public utility companies in the region.

Competence building:
Entities supporting the entrepreneurial environment in the region (SPOT Network, development agencies, territorial units of chambers of commerce and industry and chambers of crafts and small businesses, business zones), educational institutions, and scientific research centres.

Awareness-raising:
Regional Development Agency for Podravje – Maribor, E-Institute, University of Maribor, Chamber of Commerce and Industry of Štajerska, Chamber of Craft and Small Businesses of the Podravje Region, Javni holding Maribor d.o.o., public enterprises of the municipalities of Podravje, local/regional/national media.

Timeline

Regional platform:
Annual development conference in November.

Competence building:
Training programme in place – May 2025
Self-education platform operational – October 2025

Awareness-raising:

2024/25: Establishment of a communication channel, or adaptation of an existing communication channel, with the aim of showcasing examples of bioeconomy good practices with the goal of raising awareness among the public and stakeholders.

2024/2025: Agreement reached with key stakeholders on showcasing examples of good practices on the communication channel of RDA Podravje – Maribor.

Periodic – every three months: regular monitoring of regional activities in the field of circular bioeconomy and green transition, highlighting examples of good practices, and, in case of new stakeholders, involving stakeholders in the activity.

Indicators to measure progress

Regional platform:
One regional event per year
Active Online Hotspot

Competence building:
Operational self-learning platform for the preparation and management of circular bioeconomy according to the industrial symbiosis system: 1

Awareness-raising:
Number of publications – at least one publication every three months

3.2 Regional data collection as a basis for the CSS

Description

Regional data generation is key to analysing the circular bioeconomy and establishing new forms of cooperation for the closing of regional material flows. To this end, RDA Podravje – Maribor and E-Institute will establish a focal point for data collection in the field of waste management, available secondary raw

materials, available biomass, consumption and recovery of primary and reused raw materials in the region, etc.

Resources and prerequisites

Obtaining reliable regional data from both providers and users, as well as from the institutions in charge of data collection (e.g. Statistical Office of the Republic of Slovenia – SURS).
The concept of links and accesses to different databases (Municipality of Maribor, economic interest grouping (EIG), Javni holding Maribor d.o.o. (JHMB) , OPSI platform, SURS, Municipalities of Podravje)

Stakeholders

EIG of the region and municipalities, municipalities of the Podravje region, University of Maribor (FERI and others), SURS, Ministry of the Environment, Climate and Energy, Ministry of Public Administration, Ministry of Digital Transformation, Ministry of the Economy, Tourism and Sport, Ministry of Cohesion and Regional Development (especially the Regional Policy Laboratory), municipal and private public services in the region (municipal waste and water management), construction companies, industrial zones in the region, etc.

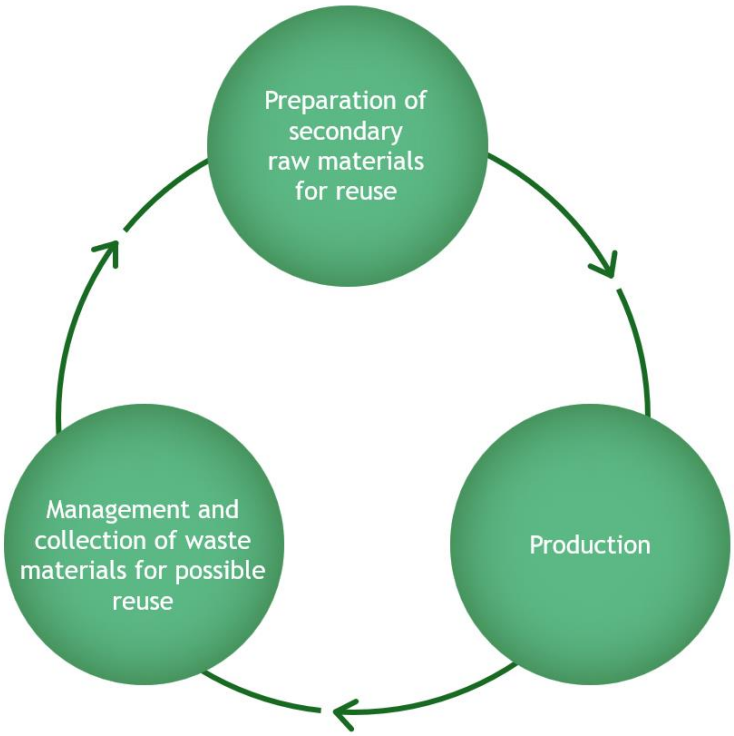
Timeline

January 2025 – Data collection and display model selected
March 2025 – Relevant data at the level of the whole region are collected and made publicly available at the focal point for data collection

Indicators to measure progress

Regional data monitoring system for the circular bioeconomy in place: 1

3.3 Closing regional material cycles



Description

In accordance with the Regional Strategy for the Transition to a Circular Bioeconomy, territorial alliances will be formed to conclude a thematic Green Deal to close regional material flows. The formation of territorial alliances among stakeholders will increase the capacity to support the circular economy and increase the capacity for circular management of regional resources.
The purpose of the agreement is to agree on an inventory of available material resources in the region and their possible use for economic purposes.

Resources and prerequisites

RDA Podravje – Maribor and/or E-Institute take on the role of coordinators and facilitators of regional stakeholders who, in accordance with mutual agreement, form territorial partnerships to close specific material flows and determine mutual relations in the context of the mutual thematic Green Deal.

Territorial partnerships can be set up immediately after thematic stakeholder meetings have taken place and are formed as needed, so that there is no time limit on the completion of activities.

The financial input is tied to the implementation of the event, so it makes sense for such events to be linked to other events among stakeholders, thus optimising the use of both time and financial resources.

Stakeholders

Institute of Agriculture and Forestry Maribor, Institute of Agriculture and Forestry Ptuj, Agricultural Institute of Slovenia, University of Maribor, agricultural cooperatives, regional producers, Chamber of Commerce and Industry of Slovenia (regional sections), producers, waste managers (resources/raw materials).

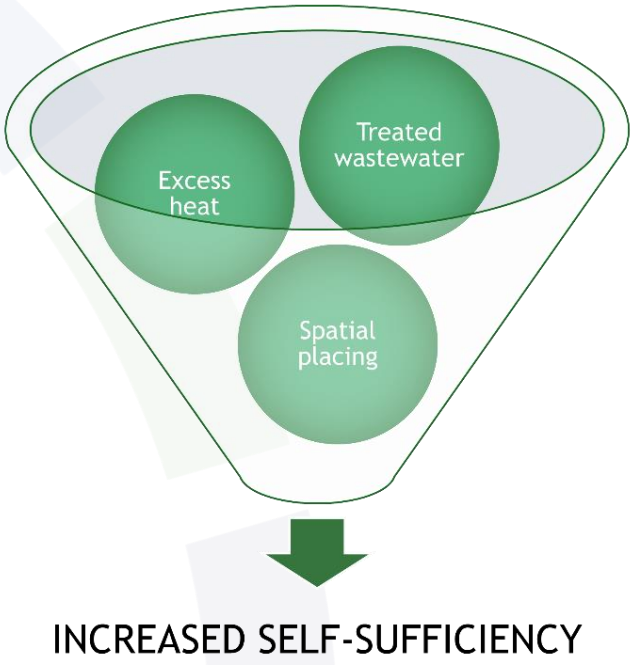
Timeline

2025 – unlimited

Indicators to measure progress

Number of territorial partnerships in the region
Number of stakeholders involved in each territorial partnership

3.4 Circular greenhouses and growing vegetables indoors



Description

This systemic solution contributes to closing the material cycles of biowaste and other biodegradable remains (agriculture, industry, sewage sludge, river and lake sediments, maintenance of green areas, etc.) at the regional level, by establishing production of food (vegetables) in enclosed spaces with controlled climatic conditions for production throughout the entire year.

The CSS connects the following material cycles:

- Household biowaste
- Biomass generated with maintenance of river basins
- Biomass generated with maintenance of forests and other green areas
- Organic material generated with wastewater treatment and animal husbandry
- River sediments
- Excess heat from hydroelectric power plants and industry, also geothermal heat
- Water for irrigation from hydrotechnical facilities of hydroelectric power plants on the Drava river and wastewater treatment facilities

The production processes require fertilising, enriched soil, along with water and energy sources, which will all be provided by the above-mentioned material cycles. These cycles will be closed at the location where they originate and the produced food will be available for the market and supply to public institutions in the region.

The locations for implementation can be found in all parts of the region, but mostly in municipalities with adequate spatial plans. Greenhouses can also be set up in degraded areas as part of regeneration.

Resources and prerequisites

In order to set up the system, the following needs to be ensured:

- Detailed technological design: technological solutions are known and available in the market but need to be adapted with regard to the available resources and location. The technology used also depends on the crops grown in each particular case.
- Economic and financial aspect: it is necessary to prepare business plans for individual locations and documentation for financing the implementation.

- Environment and legislation: in locations where spatial conditions are in place, the projects can be implemented immediately, while in other locations (such as agricultural land) additional relevant procedures need to be implemented beforehand.
- Source of funding for setting up the infrastructure: private and public sources, public private partnership.
- Establishing new value chains: connecting stakeholders which are active in various value chains (biological waste, biomass, treated wastewater, river sediments, excess heat) and creating new business models with stakeholders in individual chains for establishing food production in greenhouses and indoors.

Financial resources vary depending on the location and size and should be individually evaluated for each greenhouse, with a plan for attracting investors.

Stakeholders

Municipalities in the region with adequate land plots and responsible for spatial planning

Energy providers (DEM, d.o.o.)

Agricultural sector (Agricultural Institute of Slovenia, Institute of Agriculture and Forestry Maribor, Institute of Agriculture and Forestry Ptuj, cooperatives, large producers)

Water and energy suppliers (JHMB, Komunalno podjetje Ptuj, KSB, and others)

Timeline
2025–2030

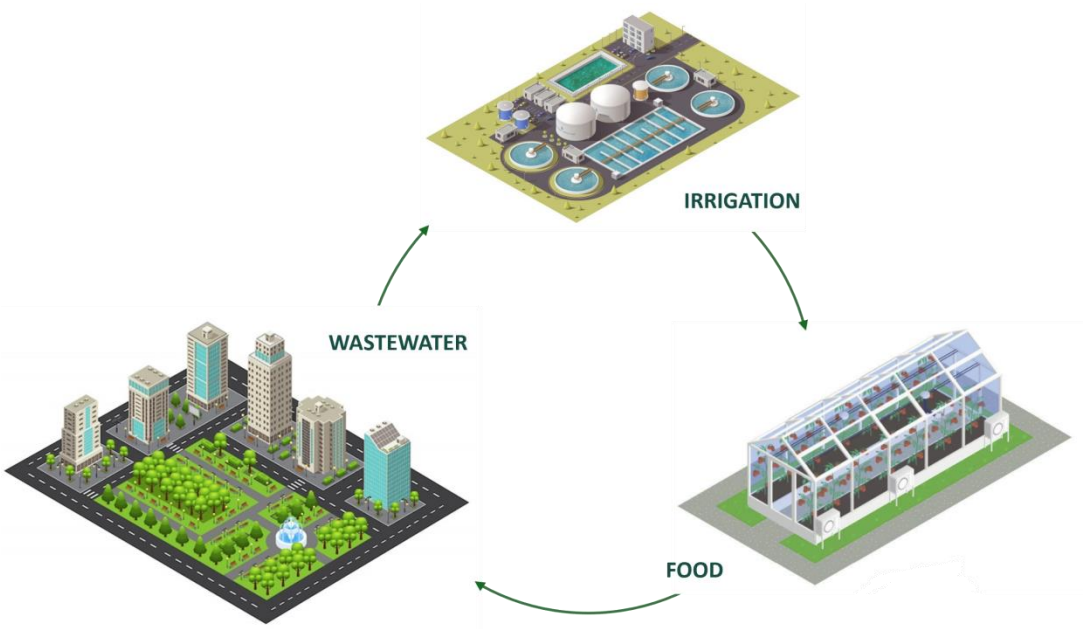
Indicators to measure progress

Number of set up greenhouses – 10% increase by 2030.

Total area of agricultural production within greenhouses – 20% increase by 2032 (with regard to the 2024 baseline).

Demonstration centre for food production in greenhouses – one by 2030.

3.5 Reuse of sewage sludge and water from wastewater treatment plants



Description

Cities produce communal and industrial wastewater, which is treated in wastewater treatment plants and returned to nature, once it has reached a high enough level of purification not to endanger the environment or human health.

This water will be used for other purposes for which drinkable water is currently being used, thereby reducing the consumption of this natural resource.

Treated water from wastewater treatment plants could be used in industry (to cool or to clean machinery) and in agriculture (watering and irrigation of crops, providing humidity for growing plants).

Infrastructure would need to be provided for the reuse of treated water so that it could be discharged to industrial or agricultural plants and not discharged directly into the environment.

It is also possible to process the sludge that is left over from the treatment of water in wastewater treatment plants and convert it into ash, which can be used to produce fertilisers (in connection with CSS – Thermal treatment of

sewage sludge and biomass with nutrient extraction and energy production). The water can also be used in industry without further treatment.

A DEMO testing site is being set up within the CircSyst project at the location of the municipal wastewater treatment plant in Ptuj, on land owned by the Agricultural Institute of Slovenia.

Resources and prerequisites

The main resources are the raw materials generated by the wastewater treatment plants:

- Treated municipal water
- Sludge, a by-product of municipal water treatment

A line is also needed to supply treated wastewater to agricultural production. The costs vary depending on terrain and distances.

Stakeholders

The key stakeholders are:

1) Operators of wastewater treatment plants in the Podravje region:
   - Komunalno podjetje Ptuj d.d.
   - Komunala Slovenska Bistrica, Podjetje za komunalne in druge storitve d.o.o.
   - Komunalno podjetje Ormož d.o.o.
   - Komunala odtok, komunalne storitve d.o.o.
   - Municipality of Ormož
   - Municipality of Rače-Fram
   - Municipality of Videm pri Ptuju
   - Paloma Sladkogorska, Tovarna Papirja d.d.
   - Mariborski Vodovod
   - Municipality of Lenart
   - Vzdrževanje in gradnje Kidričevo, javno podjetje d.o.o.
2) Potential water users:
   - Nigrad, d.o.o.
   - DARS, d.d.
   - Industrial zones in the region
   - Agriculture in the region
3) Potential users of sludge:
   - Chemical industry (fertiliser production)

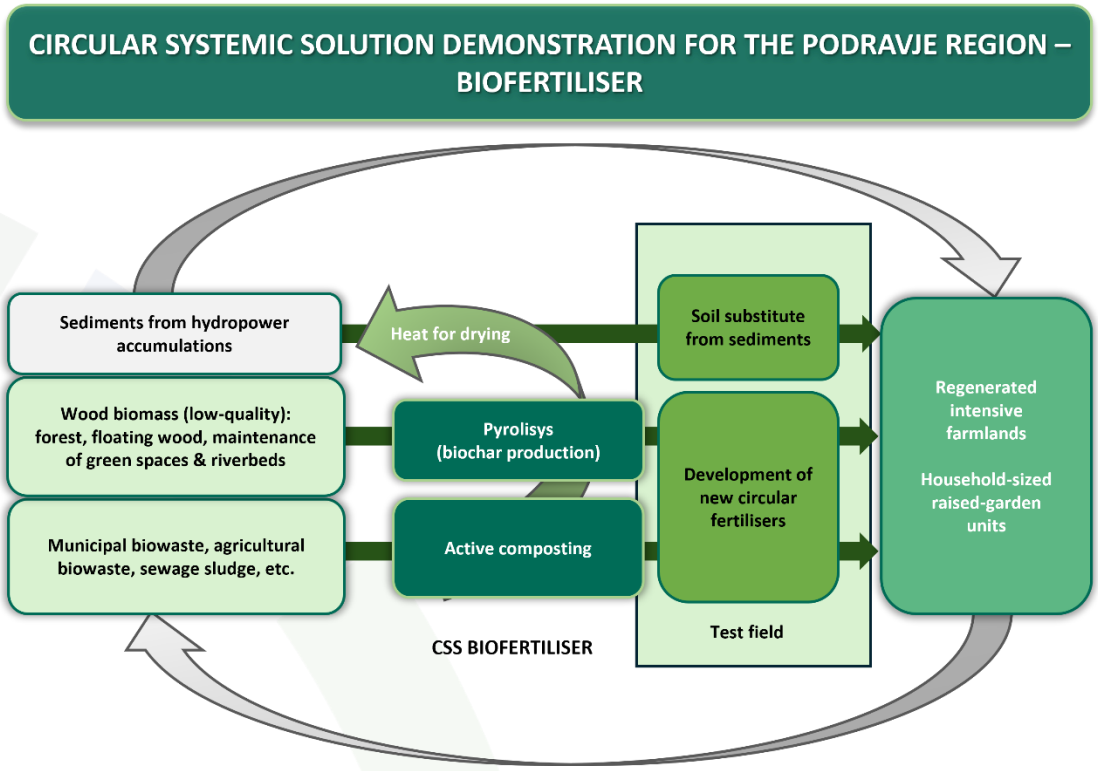
Timeline
2025–unlimited

Indicators to measure progress

Industrial water use – water use in industry (and agriculture) by type of water:

- Number of businesses using recirculated water;
- Increased share of water used for recirculation;
- Increased share of reused water.

3.6 Processing and circular use of municipal and industrial biowaste



Description

The humus content in the soil is the key element for successful crop production, as humus-rich soil increases the soil's capacity to bind CO_2 and exchange CSS nutrients, while also having a higher water-storage capacity. For this purpose, the CSS of biofertilisers closes the material cycles of biowaste and other biodegradable materials (from agriculture, industry, sewage sludge, river and lake sediments, maintenance of green spaces and watercourses, etc.) at

the level of the region of Podravje, by establishing a centre for production of an organic fertiliser with the purpose of regeneration of the intensive farming areas in Podravje.

The circular systemic solution will connect the following material cycles:

- Household biowaste
- Biomass generated with maintenance of river basins
- Biomass generated with maintenance of forests and other green areas
- Organic material generated with wastewater treatment and animal husbandry
- River sediments

The treatment process will combine various technological processes such as pyrolysis for transforming wood biomass into biochar, active composting, mixtures, and production of pellets. The purpose is to create a mixture that will best activate natural processes in the soil, thus contributing to health and fertility of agricultural soils. The final product will be a circular organic fertiliser, created for application on agricultural land in the region. The investment will cover the acquisition and commissioning of additional capacities for active composting, pyrolysis, technological equipment for the recovery of excess heat and drying of input materials (potentially also sewage sludge), a mixing plant, and pelletising equipment.

The recovery centre will be set up within the CERO Gajke Ptuj waste management centre, where an investment into additional infrastructure (capacity for active composting, pyrolysis, and mixing) will take place.

Resources and prerequisites

To establish the process and make the centre fully operational, the following needs to be ensured:

- Detailed technological design: a technological solution for the implementation of the process needs to be developed and scaled in terms of the quantity of input materials and market requirements. The specifications will be finalised by February 2025.
- Economic and financial aspect: it is crucial to determine the economic aspects of the full-scale operation, including an analysis of the entire value chain, presentation of costs and benefits of the proposed solution, and an assessment of the technical, financial, and environmental (also legal) feasibility of the solution. Furthermore, the financial gap of the

project needs to be determined. The feasibility study is under preparation and will be finalised by February 2025.

- Environment and legislation: environmental aspects need to be defined and analysed, key risks need to be identified, and solutions provided.
- Financial sources for setting up the infrastructure: depending on the estimated financial gap, adequate financial sources must be ensured for the construction of the centre.

Stakeholders

Javne službe Ptuj, d.o.o. (key stakeholder): provider of public services in the management of municipal waste and manager of the CERO Gajke Ptuj waste management centre, where the centre for the circular production of biofertilisers will be established.

Komunalno podjetje Ptuj, d.o.o.: provider of public services of wastewater collection and treatment, which generates large quantities of sludge, one of the input materials for the production of circular fertilisers.

Vodnogospodarsko podjetje Drava Ptuj, d.o.o.: holder of the concession for the maintenance of river basins. It thus manages large quantities of low-quality wood biomass, which would become part of production of biofertilisers through pyrolysis.

Dravske elektrarne Maribor, d.o.o.: holder of the concession for the hydropower exploitation of the Drava river where large amounts of river sediments are gathered in accumulation lakes. These need to be removed and can be used as potential raw material for the production of the circular fertiliser.

Chamber of Agriculture and Forestry – Ptuj and Maribor branches: representatives of stakeholders from the agricultural sector, particularly in terms of market analysis and acceptability (technological characteristics and price) of the final product by final users.

Agricultural Institute of Slovenia: research organisation involved in the process of development of the technology and the final product.

E-Institute: competency partner for the coordination of the process, preparation of the feasibility study, preparation of the technological solution, and acquisition of financial resources.

Timeline

Development of the technological solution for the Centre for the circular production of biofertilisers: 2025

Feasibility study for the Centre for the circular production of biofertilisers: 2025

Formula for the preparation and shape of the final product: 2025

Obtaining permits for setting up the infrastructure: 2026

Obtaining financial sources for the construction of the centre: 2026

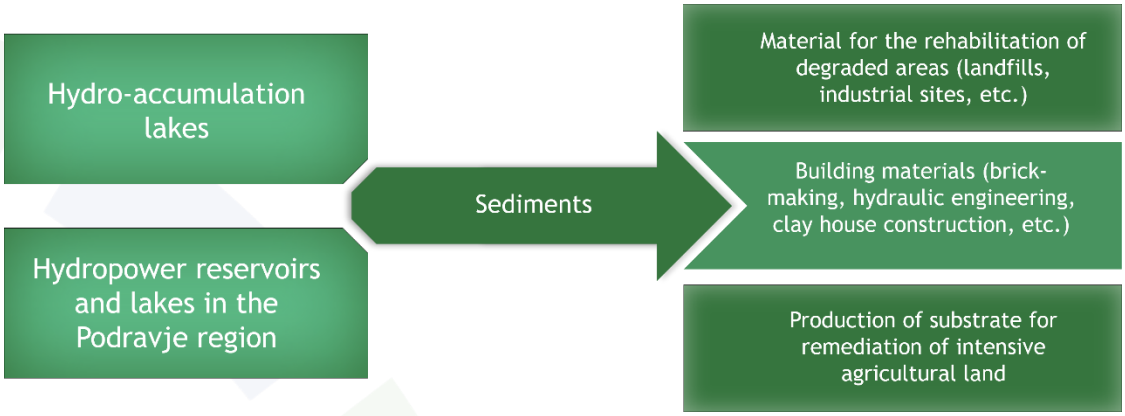
Beginning of the construction of the Centre for the circular production of biofertilisers: 2027

Indicators to measure progress

Share of intensive farming areas in the region regenerated with the circular biofertiliser: 20% by 2030

Reduced use of artificial fertilisers in intensive farming areas in the Podravje region: 20% by 2032

3.7 Use of sediments from rivers and lakes



Description

Sediments from rivers and lakes are naturally piled; however, if not regulated, they reduce the volume of the water body and thus the production of electricity from hydroelectric power They also endanger natural habitats, eventually leading to the extinction of plant and animal species. Furthermore, sediments reduce the capacity of water bodies for receiving large amounts of intense rainfall. The sediments therefore need to be regularly and technically-appropriately removed and used in a sustainable way.

This CSS closes the circular flows of naturally deposited sediments in rivers and lakes by using and recovering them for construction and agriculture (targeted cultivation of crops).

The prepared solutions are the result of research and development work of Dravske elektrarne Maribor, d.o.o., which succeeded in demonstrating the possibility of industrial use of sediments for brick production and researched the possibility of using sediments for the rehabilitation of landfills and the construction of river embankments. This segment of use has already reached technology readiness level 8 and is ready for commercialisation.

Another segment of use is the revitalisation of degraded areas and areas of intensive farming. Further research and testing is needed here. Research is also needed for the possibility of mobile production of construction elements for traditional earth houses, which is currently at technology readiness level 4.

Resources and prerequisites

To establish the processes, the following conditions need to be met:

- Implementation of R&D projects: implementing projects for testing the use of sediments from different sources (mostly currently unexplored detention basins and lakes in the region) in agriculture, construction, and revitalisation of degraded areas.
- Detailed technological design: technological solutions are known and available on the open market but need to be tailored based on the available resources and location. The technological solutions depend on the usage of sediments and their composition.
- Economic and financial aspect: business plans for individual uses of the proposed solutions need to be prepared in order to include the material in other value chains in the region. Documentation for the financing of the implementation needs to be prepared.
- Environment and legislation: health risk analyses have to be prepared with regard to the origin and composition of sediments. In locations, where spatial conditions are met, the projects are ready for implementation. In other locations (agricultural land), the appropriate procedures must be carried out.
- Financial sources for setting up the infrastructure: private sources, public sources, public-private partnerships.

Stakeholders

Municipalities of the Podravje region: most municipalities have larger or smaller watercourses, some have natural lakes and some also artificial or accumulation lakes. Properly prepared sediments can be used in rehabilitation work on infrastructure and for the regeneration of degraded areas.

Managers of watercourses and lakes: Dravske elektrarne Maribor, d.o.o., Vodnogospodarsko podjetje Drava Ptuj, d.o.o.

Economy: Chambers of Agriculture and Forestry, producers or processors of hemp, construction industry.

Timeline

2027–unlimited

Indicators to measure progress

Annual amount of removed sediment – t/year

Annual amount of used sediment – t/year/ m^2

Crop production on revitalised areas – m^3/year

3.8 Processing of the region's green cuttings

Description

Nigrad, a public utility company, currently processes EWC code 17 waste: construction and demolition wastes (including excavated soil from contaminated sites), which includes wood without green parts. They want to extend the processing line to EWC codes 19: wastes from waste management facilities, off-site waste water treatment plants and the preparation of water intended for human consumption and water for industrial use and 20: municipal wastes (household waste and similar commercial, industrial and institutional wastes) including separately collected fractions.

For this purpose, the current demonstration facility in Dogoše would be upgraded and the infrastructure improved to enable the processing of such waste.

At the same time, the company would like to expand its scope of operation from the Municipality of Maribor also to other municipalities of the region.
This would allow Nigrad to process various types of low-quality biomass, such as tree branches left over from pruning, which the company currently does not do.

Resources and prerequisites

Obtaining permits for processing waste with EWC codes 19 and 20 – by the end of 2024.

Upgrading the infrastructure and technological processes – required investments of approximately EUR 1,000,000; to be implemented when funds are acquired (potential investment project).

Stakeholders

Ministry for Natural Resources and Spatial Planning, Municipality of Maribor, other municipalities in the Podravje region, Nigrad d.o.o., other utility companies, holders of concessions for managing public and private green spaces.

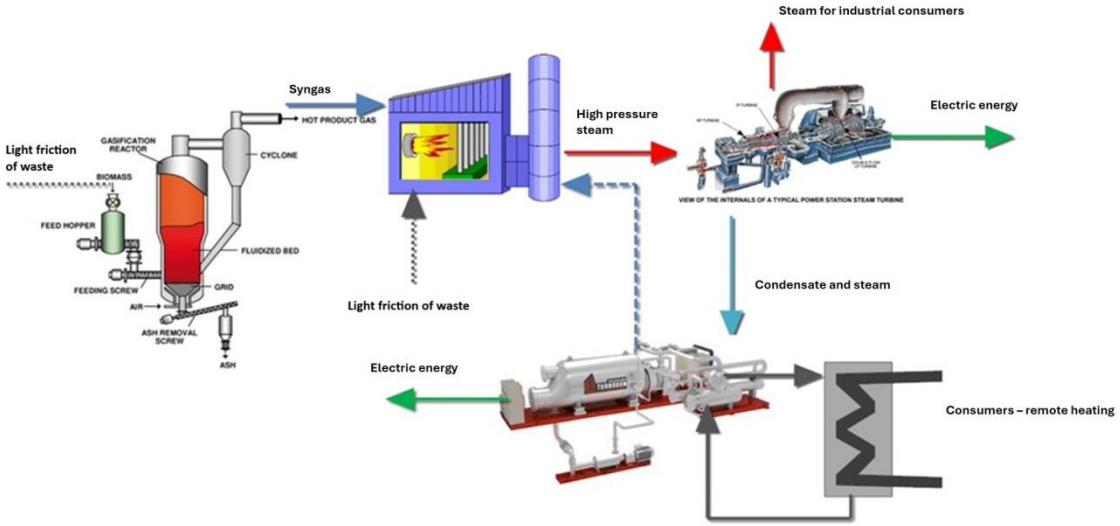
Timeline

Obtaining permits: by the end of 2024
Investment in scale-up of demo site and infrastructure: undetermined (upon securing funding)

Indicators to measure progress

Quantity of processed low-quality biomass

3.9 Thermal treatment of sewage sludge and biomass with nutrient extraction and energy production



Description

Municipality of Ptuj expressed interest in providing the location for a facility for thermal processing of waste in the territory of the municipality and the documentation was prepared by ZRS Bistra Ptuj and LEA Spodnje Podravje, who designed the project for the construction of an incineration plant for light fractions of municipal waste with co-incineration of sewage sludge and low-quality biomass. The facility would cover the entire cohesion region of Eastern Slovenia. Different technologies were proposed but the selection of the final one will be determined in pursuit of maximising the achievement of circular goals, energy potential, and solving the challenge of sewage sludge treatment and the production of fertilisers (phosphorus).

The project needs further political and systemic support for its implementation.

Resources and prerequisites

To set up the process, the following conditions need to be met:

- Obtaining political support at local, regional, and national level, ensuring the support of the local population, and achieving consensus with municipalities of the Eastern Cohesion Region.

- Detailed technological design: selecting the technology and defining input material streams (type of waste and other fuel) and quantities.
- Economic and financial aspects: determining the economic factors of the full-scale operation, primarily for the area of waste and fuel collection, including an analysis of the value chain, presentation of costs and benefits of the proposed solutions, and an assessment of the technical and financial feasibility of the solution (feasibility study).
- Environment and legislation: environmental and legal issues need to be identified and analysed and, key risks exposed and solutions prepared.
- Financial sources for setting up the infrastructure: the financing model (public sources, private sources, public-private partnerships) needs to be defined.

Stakeholders

Municipality of Ptuj: coordinator and implementer of the initiative and process.
Javne službe Ptuj d.o.o.: provider of public services in the management of municipal waste and manager of the CERO Gajke Ptuj waste management centre.

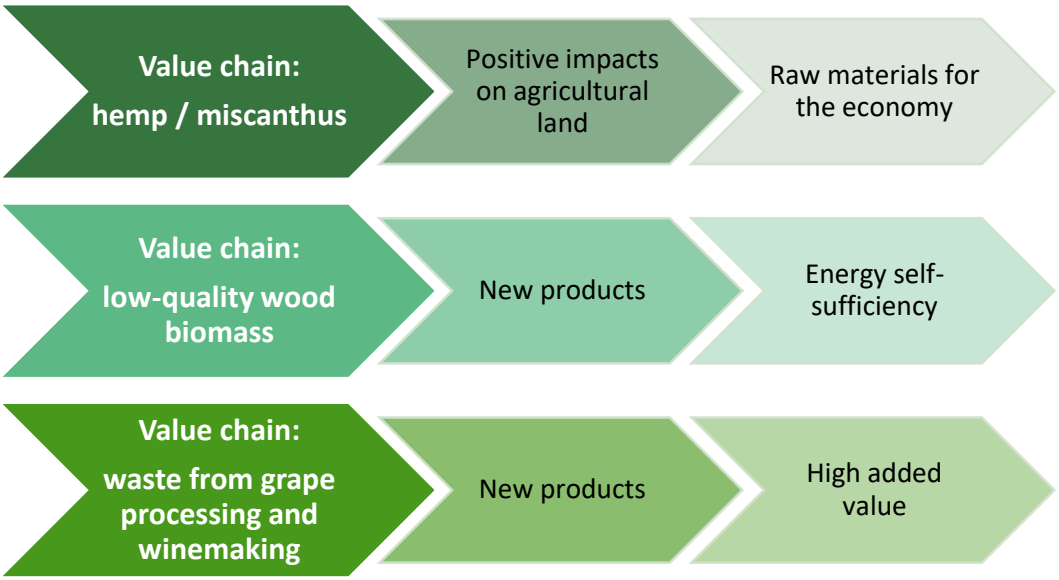
Komunalno podjetje Ptuj d.o.o.: provider of public services of wastewater collection and treatment, which generates large quantities of sludge, one of the input materials for co-incineration.

ZRS Bistra Ptuj and LEA Spodnje Podravje: expert support in the processes.
Municipalities of the Eastern Cohesion Region.

Timeline
After 2028

Indicators to measure progress
To be determined.

3.10 Assessing the circular biomaterial of individual material flows



Description

The circular systemic solution of Circular biomaterials covers the area of individual material flows, which can be residue from production (wine, pumpkin seed oil), or a crop from the improvement of soil quality or crop rotation in fields. Using the surplus of biological matter from closed production processes can provide a higher value for products, which reach higher added value on the market.

In line with the EU's green transition policy, several bio-based materials/products will be developed in the coming years. At the end of their life cycle, they will be biodegradable and will replace materials/products of fossil origin.
In the long term, this means that sufficient quantities of such materials must be provided to enable their use.
For this purpose, new value chains will be established for specific circular biomaterials that can achieve the following impacts:

1) Hemp/ Miscanthus value chain
   - Improved soil quality: hemp has deep roots that help break up compacted soil, improve aeration and reduce erosion. It also contributes to organic matter, which improves the structure of the soil

and nutrient content. This is especially useful for crops such as maize or soybeans, which deplete soil nutrients.
- Pest and weed control: the fast and dense growth of hemp provides natural weed control by shading out competitive plants. It also has very few natural pests, which reduces the need for pesticides.
- Breaking disease cycles: by including hemp in crop rotation, farmers can break the life cycles of pests and diseases and reduce the likelihood of infections in subsequent plantings.
- Soil revitalisation: hemp can absorb heavy metals and toxins from the soil through phytoremediation. This can significantly help to improve the soil quality, making it more suitable for future crops.
- Various uses: hemp can be used for its fibres, food (seeds), oil, and CBD, which ensures economic benefits of its inclusion in the rotation of crop cycles.
- Efficient use of water: compared to other crops such as cotton, hemp requires less water. It is therefore a viable alternative for regions prone to drought or water scarcity.
- Strengthening the economic potential of the region: by exploiting and producing high value-added hemp/miscanthus products.

2) Low-quality wood biomass value chain
   - Utilisation of local potential for energy provision (through remote heating and individual systems).
   - Creating new value chains (production of wooden pellets) in the region, bringing new economic value and reducing the region's energy dependence.

3) Value chain for residue from grape processing and winemaking
   - Use of waste created during grape processing and winemaking as a new regional value chain.
   - Producing products with high added value (such as oil) that contribute to raising the added value of the region.

Resources and prerequisites

The following steps need to be taken to ensure the success of the CSS:
- Definition of areas suitable for individual activities and stakeholders (partners) of each value chain.
- Detailed technological design: technological solutions are already available and individual small-scale processes for processing waste into

products are being implemented. However, the processes are not systemically connected or linked. Value chains for processing produced materials for further use are not yet established.

- Economic and financial aspect: based on the product prices, the projects can be directly financed by manufacturers.
- Environment and legislation: environmentally, the foreseen processes are a welcome addition, as natural materials are used for the products and their growth properties have a positive impact on the improvement of the natural environment.
- Financial sources for setting up the infrastructure: private sources, public sources, public-private partnerships.

Stakeholders

Municipalities of Podravje: reduction of bio-residue from wine production, improving soil quality through crop rotation.

Winegrowers: grape seeds are used to produce grapeseed oil, which has healing properties and is used in cooking (Kokol Farm, Ciglence, Sp. Duplek).

Hemp producers: the first hemp facilities have already been built in Slovenia. As hemp grows, it can also be used for other purposes, especially for medical purposes.

Managers of forests, green areas, and watercourses (low-quality biomass).

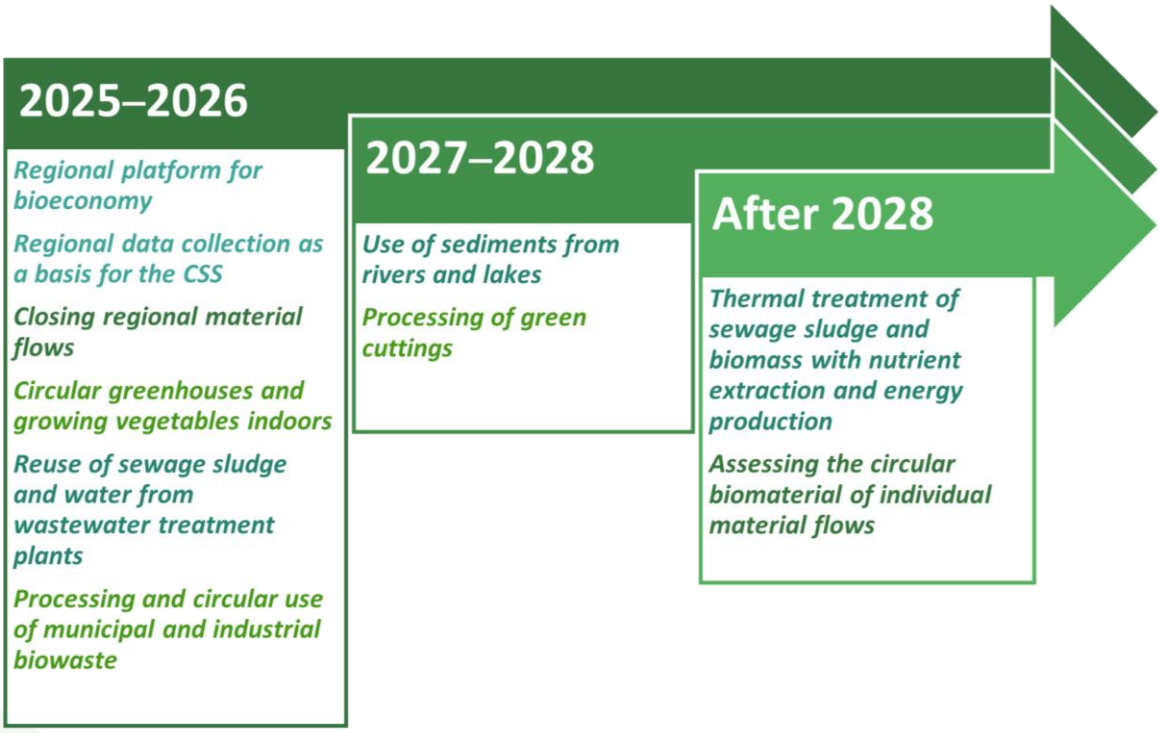
Timeline

After 2028

Indicators to measure progress

IMPACT INDICATORS	%
Grapeseed oil	l/annually
Area for the production of hemp	year/ha
Use of low-quality biomass for energy production	m^3/annually

4 Action Plan Timeline



5 Monitoring and Evaluation

The strategy foresees that RDA Podravje – Maribor, as the coordinator of the Podravje – Maribor CCRI Pilot, and the E-Institute, as coordinator and expert partner in CCRI, are responsible for the preparation and monitoring of the circular bioeconomy strategy, the development of the Action Plan, and the measures for the implementation and achievement of the strategic objectives.

They will therefore also be responsible for monitoring of the implementation of the CSSs. To this end, a Monitoring Board will be set up, composed of the stakeholders implementing the CSSs and at least one of the coordinators (RDA Podravje – Maribor and/or E-Institute).

This Monitoring Board will monitor the implementation of the CSSs and the achieved progress in accordance with the set indicators, defined within each CSS. It will prepare an annual monitoring report for each implemented CSS.

Based on the annual monitoring report, the Regional Council will assess the implementation of the strategy and the achievement of the strategic objectives.

In case of deviation from the targets set in the Action Plan, the Monitoring Board will prepare an action plan for the implementation of the CSSs to achieve the set objectives.

6 Conclusion

This Action Plan is a living document, which will be continuously monitored by RDA Podravje – Maribor and E-Institute, with provided annual reports. It will contribute to the regional transition towards a circular bioeconomy through the implementation of activities proposed for each circular systemic solution, which will be implemented according to the defined matrix of priorities.

Based on the implementation of the Action Plan, the region will:

- Raise awareness and capacity among regional stakeholders to implement the CSSs for the transition to a circular bioeconomy,
- Overcome the lack of networks supporting the implementation of green transition,
- Provide demonstrated circular solutions ready to be scaled up by investors,
- Close material flows and increase the use of regionally-sourced secondary raw materials,
- Develop regional biocircular value chains.

Circular Cities & Regions Initiative
Pilot PODRAVJE

RRA PODRAVJE MARIBOR
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October 2024

Regional Development Agency for Podravje – Maribor

E-Institute, Institute for Comprehensive Development Solutions