LIGHTHOUSE PROJECTS IN THE DANUBE REGION – CATALOGUE OF BEST PRACTICES IN 2025

Final Version
Of the EUSDR PA 8 Project Study Document

Identification of Lighthouse Projects in the Danube Region and Implementation of Communication Measures to ensure Competitiveness of Enterprises

by
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on behalf of
Priority Area 8 of the EU Strategy for the Danube Region

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Chamber of Commerce and Industry of Slovenia (CCIS) is the largest and most influential business network in Slovenia, representing the interests of over 7.000 companies across all sectors and regions of the country. Within EUSDR PA 8, CCIS is leading the Working Group on Circular Economy and Bioeconomy.

Title picture: Donau-Reise beginnt am Leuchtturm | SN.at

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1. INTRODUCTION

The purpose of this study is, in a nutshell, to showcase just how innovative and multi-faceted the Danube Region is. By identifying lighthouse projects/initiatives/institutions and best practices (to be called Danube "Lighthouses") in sectors that can be considered most relevant for the future of the competitiveness of enterprises in the Danube Region and beyond, the visibility of exactly this character should become more accessible to stakeholders and those in search of matchmaking options and inspiration for own solutions. This effort is not conducted just because it is one that makes us all feel more optimistic in times of multiple crises and transformation requirements facing companies and their employees to equal degrees – but because looking at best practices that resent and push back negative consequences of crises, that show or lay the foundation for resilience because they are sustainably innovative; allows for learning, inspiring, adapting and adopting. Such inspiration by best practice, aiming at a more widespread use of innovative and effective solutions, is what is intended to increase competitiveness of enterprises in the Danube Region in the frame of this endeavour. All 14 countries of the EU Strategy for the Danube Region (EUSDR) are covered in this study (EU countries: Austria, Bulgaria, Croatia, Czech Republic, Germany (Baden-Württemberg and Bavaria), Hungary, Romania, Slovakia, and Slovenia; non-EU countries: Bosnia and Herzegovina, Moldova, Montenegro, Serbia, and Ukraine).

This goal has been incorporated in the way that this study searched for potential lighthouse projects, best practices and initiatives in the Danube Region. First, many kinds of initiatives can help the (future) competitiveness of enterprises, which is why the search was not limited to either companies, EU projects, funding instruments or such like, it did not even define any types of projects beyond that. Instead, filtering the lighthouse projects presented in this study out of the list of identified options was based solely on how innovative these projects are, very importantly, if they are in fact something that learning from may work in practice (replicability) and under different circumstances (scalability) and whether they are sustainable in the sense that even if the effort would be stopped, there would be lasting benefits. Moreover, alignment with the EUSDR Priority Area 8 focus on strengthening the competitiveness of enterprises was ensured.

The study is structured to provide readers with a clear and logical overview of the lighthouses identified and to put them in context. It begins with further introductory comments outlining the study's purpose and scope, followed by background information on the current state of the region and the study's alignment with EU and EUSDR priorities. The methodology section explains how projects were identified and evaluated, detailing the use of questionnaires, scoring grids, and selection criteria. The core of the document is the Danube Lighthouses catalogue, grouped by the three thematic fields (see in detail below) that are circular economy/bioeconomy, digitalisation/AI and Metaverse, and supply chains & finance, each accompanied by key details. In-depth project descriptions follow, offering insights into objectives, activities, impacts, and lessons learned. The study concludes with policy recommendations, a discussion of future trends, and a summary of key findings. Additional elements, such as illustrations, support understanding and further exploration.

A thank you note goes out to the project partners Pannon Business Network in Hungary and the Chamber of Commerce and Industry of Slovenia. Without their intense contribution and involvement, scanning three fundamentally different focus of action areas throughout the Danube Region would hardly have been possible. The same thank you goes out to the contractor, Priority Area 8 of the European Strategy for the Danube Region, for remaining in close collaboration with the implementing

consortium and assisting with questions of any kind. This is the final version of the study that does include the list of Danube Lighthouses and their descriptions. In a different style and format, these descriptions can also be accessed on the website of EUSDR PA 8, where short descriptions and presentations on all 30 projects are available. Also, all basic project data like running timeframes, funding amounts and sources as well as partnership lists can be found there.

2. BACKGROUND

2.1 CURRENT STATE OF PLAY IN THE DANUBE REGION

There is no clear tendency which could be drawn from the process and results of this study that shows in what ways the Danube Region, or specific parts of it, is lacking development in fields of the future in general. Promising and innovative activities could be identified in each and every EUSDR member state – importantly, many more than presented here. Still, it must be stated that especially in the most contemporary fields of digitisation and its many application possibilities, there was a considerable lack of uptake and widespread industrial or application-related use of these technologies apparent when scanning for lighthouses.

This becomes more visible when looking at the number of projects identifiable within limited time, and when looking at how outstanding or common they are for a certain region. Exceptionally innovative single projects may sometimes raise a misguided interpretation of how strong the landscape in the respective field might be overall. However, this should not make one refrain from making these approaches visible, as they may lead to more widespread use of new technologies.

The sheer tempo of developments in sectors such as AI, Industry 5.0 and Metaverse is something that all kinds of actors in the Danube Region have trouble adapting to some degree, including SMEs as well as clusters and the public sector. Financing/funding and other support systems therefore are becoming ever more relevant. This topic will be tackled further in the chapter on policy recommendations.

Comparable experiences have been made by Steinbeis Europa Zentrum and Pannon Business Network with the implementation of the AI Interreg Danube Region project BrAIn, which shows that a relative difficulty in the identification of a broad landscape of application best practices, especially in the more advanced AI and Metaverse sectors, cannot be a surprise. Calls for more strategic effort in strengthening stakeholders in the Danube Region are justified as the global pace of development is an external factor determined mostly by players beyond Europe and cannot be hedged.

2.2 EU AND EUSDR POLITICAL PRIORITY ALIGNMENT

In the autumn of 2024, Mario Draghi released his landmark report on European competitiveness. In it (Draghi 2024), among many other issues, he criticises the relative weakness in Europe, compared to global competition with the US and China, when it comes to investing in disruptive innovation and making sure that knowledge and innovation are being successfully transformed in replicable and constructive business models – what we basically frame as technology transfer. Lighthouse projects are based on both of these issues. On the one hand, they make use of the uptake of (be it incremental or far-reaching) innovation and – at the same time – apply it in a way that makes it very practical for people, for businesses, for innovation ecosystems in the lighthouse project regions and beyond.

Identifying lighthouse projects is a promising strategy in order to allow for other actors to find reference points and benchmarks for developing new models of business cases and innovative projects – while the idea of this study is of course based on making these lighthouse projects seen and letting them serve as models for innovation and best practices. Visibility, communication and dissemination activities therefore are a key effort in ensuring relevance of the study project as a whole. Past experience has shown that especially with regard to fast-transforming sectors like the ones requested for this study (green tech, circular economy & circular bioeconomy; digitalisation, artificial intelligence, metaverse & virtual worlds and supply chains & finance), there is ample need for not only visibility, but also user-friendly description of the core added value and applicability of the development at hand so that others can identify the relevant parts for own future projects.

The Danube Region under the EUSDR strategy is, in a positive and challenging sense, a high-contrast area that brings regions in Western Europe, such as Baden-Württemberg, together with regions that are right at the Ukrainian border, where Russia is leading a war of aggression. Different schools and ideas of politics, society and history, different natural resources and conditions, and of course, means of economic development and potential come together. That is why this consortium, right from the start, strongly appreciated the request to find lighthouse projects from all the member countries and several tech/industry fields, as the plurality of these factors can lead to a very multifaceted catalogue of projects, laying the basis for applicability and replicability for almost any interested party.

Throughout the project implementation phase, alignment with PA 8 priorities, but also overall EU policy strategy in times of multiple crises and political as well as economic challenges were and will continue to be provided. The challenges we face hit all the regions, but not symmetrically, as some industries and innovation bases are more vulnerable to external issues. Solutions regarding innovation, technology transfer and entrepreneurship are needed promptly in the Danube Region and beyond and are, wherever supporting competitiveness, not only in line with PA 8 priorities, but also the mainstream of policy direction in the EU at the moment – which is why this endeavour arguably came at the right time.

3. METHODOLOGY

3.1 STUDY BACKGROUND

The now implemented idea of this study was to identify a total of 30 projects in the EUSDR Danube Region that serve as examples for developments that help increase the competitiveness of enterprises as envisioned and supported by PA 8 of EUSDR. In making projects in the strongly and contemporarily important fields / focus of action areas

(1) green tech, circular economy & circular bioeconomy,
(2) digitalisation, artificial intelligence, metaverse & virtual worlds
(3) supply chains and finance

visible for a wider audience by producing a study document (which this document is the final version of) on the projects as well as online presentation files for a well-sorted way of informing, the goal is to spread best-practice and, consequently, increase innovation and technology uptake as core drivers for the competitiveness of enterprises in the Danube Region.

In order to choose the projects that can best serve as examples for innovation, sustainability and applicability in other scenarios in the future, the development of a methodology to make these decisions was a crucial step. This method relies on combining the assessment of the project representatives of the (at first) potential lighthouse projects themselves with the assessment made by a team of evaluators based on information gained by desk research, business contacts and information requests.

This way, information and experience that only the project's own managers have and that can potentially not be identified by basic desk research could be collected and included to get a full picture on how innovative the project actually is. The ratings by the project managers of potential lighthouse projects were used in calculating as well as the ratings by evaluators of the lighthouse project identification consortium – just like applying a self-assessment of oral grades that has become a mere standard in modern teaching as well.

3.2 QUESTIONNAIRE

The information given so far raises a fundamental question: How was the information for receiving two different assessments of potential lighthouse projects acquired? After a much longer list of project options in all Danube Region countries had been identified, project representatives which in that way had been taken into account received a digital questionnaire asking them to assess their own project with regard to certain categories that would qualify it as a lighthouse project. Microsoft Forms was used as a tool to realise this. The boxes on the following pages show the questionnaire as applied in MS Forms. With regard to scoring and evaluation, the following rules were applied:

- **The evaluation was realised with a scoring based on five different factors representing the priorities to be expected from lighthouse projects (see below).** The evaluators of the identification of lighthouse projects project consortium first identified projects, gained information on them via desk research and, parallelly, sent a questionnaire to stakeholders and identified potential lighthouse projects and their representatives. Accordingly, potential lighthouse project managers were able to give information and self-assess their project via the digital questionnaire (1: factor not fulfilled; 5: factor very strongly fulfilled). They were also able to give explanations about the reason that made them choose the respective score.
- **After having collected this feedback, the evaluation team scored the projects not assessed by it yet without noting the self-assessments collected before.** This way, potential bias was ruled out.
- **When comparing the evaluation team assessment with the self-assessment of potential lighthouse project representatives, the evaluation team considered the optional reasoning by them** and potentially came back to them if no reasoning for the scores was provided and some questions regarding the scores given remained open. Based on this reasoning, the evaluation team checked if a re-examination of the project in that regard was necessary and changed/did not change its score.
- **Finally, the scores were added up, counting external and self-assessment in the same way (not weighing one of them more than the other), and an overall score was generated.** This total score positioned/ranked the project within the others and decided about it becoming one of the PA 8 lighthouses now presented in this study catalogue or not.

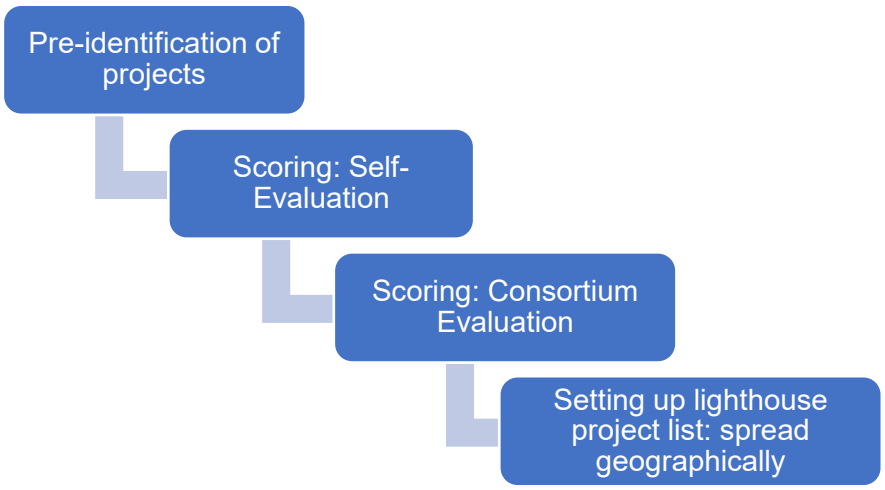

Illustration 1: Evaluation Process

Five factors that were part of the questionnaire functioned as evaluation criteria simultaneously. According to these indicators, the eligibility as a lighthouse project that makes a difference for the overall goal of competitiveness of enterprises in the Danube Region was checked.

- **Innovation & Differentiation:** High scores could be achieved if the project is highly innovative in the sense of it involving new ideas in a manner that shows practical benefits. The utilisation of technology or processual development for all kinds of use cases is essential here. Of course, relative exclusivity of the approach used in the project should be observable in order to show differentiation from previous approaches.
- **Replicability & Scalability:** High scores could be achieved only if the project tackles a problem in a manner that is not only useful in a specified use case (one-time use). The project should use an approach that can not only be replicated at a different place and time (and, maybe, for a different problem) but can also be scaled up for its use in a potential larger-scale future project and is not limited to its own case size.
- **Measurable Impact:** High scores could be achieved if the projects show impact, and, preferably, if this impact can not only be assessed but brings measurable (quantifiable) benefit. Potential lighthouse project managers were able to name and describe quantified results that they had for evaluation in a text box in the questionnaire. Of course, it was taken into account that for many project types, this is hard to achieve.
- **Sustainability:** High scores could be achieved only if the project fulfilled more than one type of the many dimensions of sustainability. Sustainability here refers to environmental/decarbonisation sustainability as well as general duration capabilities of the approach, meaning that the impact in any sense should be able to last over time and bring not only short-term benefits. A socially sustainable character was considered to be a plus as well.
- **Alignment with Strategic Goals:** High scores could be achieved if many of the PA 8 strategic goals are tackled in the project, such as: fostering cooperation and SME knowledge exchange, supporting the innovation ecosystem, improving framework and support programs for SMEs, capacity building, business support, female leadership and digital capacities of SMEs with specific focus on AI application.

At this point, it is important to understand that this methodological approach is quintessentially based on active participation of the preidentified potential lighthouse projects and their representatives. Only if somebody from the team of potential lighthouse projects answered the consortium's request, there was a way forward for it to appear in the catalogue of lighthouse projects that is the core of this study document now.

As an advantage, more concrete and first-hand information on the projects decided for is now given as there was actual contact between the consortium and the project representatives. However, a major difficulty with this approach must be named as well: It does not necessarily guarantee that only the objectively very best projects were decided for, as many very promising ones could not be reached in the scoring process. Non-participation automatically ruled out the option to become an EUSDR PA 8 Lighthouse.

The first box below shows the introduction/explanation of the questionnaire that was provided for potential lighthouse project representatives, the other box on the following page shows the questionnaire that was the basis for evaluation in its entirety.

Introduction to the Questionnaire:

Thank you for your interest in the activities of the European Strategy for the Danube Region and its Priority Area 8 (Competitiveness of Enterprises) in particular. With this questionnaire, we want to give you as a project representative the option to self-assess your initiative/project/funding scheme/endeavor regarding its innovativeness for the benefit of the region and its enterprises.

This activity is part of a study that aims at identifying lighthouse projects throughout the Danube Region. Therefore, we have prepared a questionnaire including general questions about your project and a few questions in which you will be able to answer self-assessment questions regarding the project on a scale of one to five. Optionally, you will be able to give an explanation on why you chose the respective score. Overall, the aim of this questionnaire is to identify and analyse lighthouse projects in the Danube Region, make them visible via a study document, presentations and workshops, and therefore contribute to the exchange of best practices and the competitiveness of enterprises in the region.

If chosen as an EUSDR PA 8 Lighthouse Project, this is an important opportunity for the visibility and dissemination of your project. Please note that "project" here refers to endeavors of any kind: It could be, for example, a funding instrument by a regional authority, a cluster/network initiative, an investment of a single SME into its transformation or an international project. Completing the questionnaire will take no more than 10 minutes.

For starters, we will ask you to provide basic information, a few sentences of overview regarding what the initiative/project/best practice is about, and how its mission and impact might be described. After that, the self-evaluation in five questions of a score from one to five will come up (1: not fulfilling the goal named in the question; 5: strongly fulfilling the goal named in the question).

(Questionnaire elements see next page)

Initial text boxes: Initiative/Project/Best practice Name, Initiative/Project/Best practice Acronym, Initiative/Project/Best practice Website or Link to more information, coordinator/lead partner or initiative/project/best practice main representative

Question 1: Please describe the initiative/project/best practice, its mission and impact in a few sentences.

- *Text box*

Question 2: How many project partners does/did the initiative/project/best practice have? (If your initiative is not a transnational/multi-partner project, just choose "none" – this is not any kind of disadvantage)

- *Single choice "none", 1-5, 6-10, 11-15, 16-20, "more"*

Question 3: In which of the countries and regions of the EUSDR Danube Region is/was the initiative/project/best practice being implemented? (+EUSDR country list)

- *Multiple choice*

Question 4: What kind of initiative/project/best practice is/was your project?

- *Multiple choice, Options:*

-(Investment) project of SME with/without partners	*-Initiative of a public authority, national/subnational*
-Network or Cluster	*-Interreg project*
-Funding instrument	*-Horizon Europe project*
-Nationally or regionally funded project	*-Other initiative*

Question 5: From when until when is/was the initiative/project/best practice implemented? (Please name year of project start and year of estimated project completion)

- *Text box for naming years*

Question 6: How innovative was/is the initiative/project/best practice? Does it differentiate itself from prior endeavours and add something new?

- *Score 1-5, optional: Reasoning for the score chosen*

Question 7: Could the initiative/project/best practice be replicated at a different place and time and be scaled up to a higher project scope?

- *Score 1-5, optional: Reasoning for the score chosen*

Question 8: Has the initiative/project/best practice made an impact, and can it be measured well?

- *Score 1-5, optional: Reasoning for the score chosen*

Question 9: Is the initiative/project/best practice sustainable, with regard to environmental sustainability as well as other future-related facets?

- *Score 1-5, optional: Reasoning for the score chosen*

Question 10: Is the initiative/project/best practice aligned well with the strategic goals of the EU Strategy for the Danube Region Priority Area 8, which, among others, is the competitiveness of enterprises in the Danube region?

- *Score 1-5, optional: Reasoning for the score chosen*

We would kindly ask you to leave us with your name, organisation name and email-address to be able to contact you if further information is needed for the assessment or in case of an addition to the catalogue of lighthouse projects. Moreover, it would be great to get an indication from you on whether a representative of your project would be available to present the project and its outcomes at an in-person workshop in the future. Thank you very much for completing the survey!

- *Text boxes for name, organization and email-address*

Question 11: Me or another project representative would be open to present on the initiative/project/best practice and its outcomes at an in-person workshop organised by EUSDR Priority Area 8 in the future.

- *Single choice, yes/no/possibly*

3.3 EVALUATION GRID AND METHODOLOGY

The evaluation grid was the basis for not only collecting the information necessary for the sake of later being able to make the project visible and applicable for other stakeholders, but also for sorting information into a system of careful analysis of whether and how the projects at hand are innovative and can be a model for the competitiveness of enterprises in the Danube Region. Therefore, the questions above and the score answers of the potential lighthouse project managers were integrated into the grid as well as their answers to the optional reasoning question in the digital tool. Moreover, basic information on the project which was needed for the evaluation anyway is part of the grid as well in order to have an information basis for all the activities necessary at hand at all times. The following table shows the outline of the grid as described above. In the first part, the fundamental data is provided (by project and focus of action / thematic field of the lighthouse project).

	No. EUSDR Countries	Funding	Running time	Lead Partner	Project Abstract (by PM)	Project assessment (by evaluator)
FoA 1: Green tech, circular economy & circular bioeconomy						
Project Name						
Project Name						
Project Name						
...						
FoA 2: Digitalization, artificial intelligence, metaverse & virtual worlds						
Project Name						
Project Name						
Project Name						
...						
FoA 3: Supply chains and finance						
Project Name						
Project Name						
Project Name						
...						

Illustration 2: Information Grid

In the following second part of the grid, the evaluation phase comes into play: Now, the scores of the evaluators and the project managers of potential lighthouse projects can be observed. The following table shows only two of the five main indicators of evaluation as represented in the questionnaire (in total: Innovation & Differentiation; Replicability & Scalability; Measurable Impact; Sustainability; and Alignment with PA 8 Strategic Goals). Moreover, there are columns for the score of the evaluators as well as for the project managers, and a resulting score that is generated by adding up the two scores (Score A for the evaluator and Score B for the project manager; Score “R” stands for “result”).

All “R”-scores added up generate the total score of the project, where a maximum score of 50 was possible (two times five points, throughout all five factors). The ten best projects per thematical focus of action area were in the end chosen as lighthouse projects of EUSDR PA 8. However, because the priority was also to make sure that projects from all EUSDR countries are now part of this catalogue of lighthouse projects, this information comes with the exception that sometimes projects with a lower score were also incorporated as opposed to those with a higher score from a country already represented in order to ensure geographical coverage of the whole Danube Region.

	Innovation & Differentiation				Replicability & Scalability					
	Score A	Score B	Score R	Assertion by PM (optional)	Score A	Score B	Score R	Assertion by PM (optional)	.....	Score totals
FoA 1: Green tech, circular economy & circular bioeconomy										
Project Name										
Project Name										
Project Name										
...										
FoA 2: Digitalization, artificial intelligence, metaverse & virtual worlds										
Project Name										
Project Name										
Project Name										
...										
FoA 3: Supply chains and finance										
Project Name										
Project Name										
Project Name										
...										

Illustration 3: Scoring Grid

Please note: In case of an evaluation team member functioning as coordinator or project partner of the potential lighthouse project (conflict of interest), the respective partner organisation did not participate in the scoring process. This rule was applied on two occasions.

3.4 PROJECT RANGE

It is most important to specifically note that the whole process of lighthouse project identification did not place a focus on EU projects (Horizon Europe, several Interreg formats, I3 instrument etc.) per se, but had to be open to any kind of initiative, especially outside of the current EUSDR network and framework, such as private investment and transformation projects of single or a partnership of SMEs, financing and support initiatives of regional governments or even subregional entities, or any other kind of e. g. connection efforts that enterprises in the region may profit from, regardless of the funding and coordination level. However, this did not exclude EU-funded projects from consideration as lighthouse projects in the frame of this study.

For the named goal of a wide range of projects, geographically, thematically and with regard to their approach, this was essential. From a longer list of projects, a more thorough selection could be made to reduce the total amount to 30 projects in the end, which of course increased the quality level of the projects presented. Moreover, the focus on best practice includes initiatives that the current EUSDR network may not yet know about and enable looking at new perspectives, which is why the identification of projects on multiple levels was crucial.

3.5 SCOPE AND REASONING

The prime motive behind this method of deciding for 30 lighthouse projects in the focus areas at hand was to use the widest range of information available, as desk research and evaluation only, without the opportunity for project representatives themselves to present arguments and assessment in any way, would have been rather incomplete. Even more importantly, it reduced the danger of bias on the side of the evaluators: With multiple people involved, not only the subcontracting partners in the role of identifying projects and providing evaluation information, but also the self-assessing project representatives, the much-cited problem of bias of evaluation could be mitigated and reduced. Another measure tackling this problem is that no project consortium evaluations were done by single people but only in team discussions in order to avoid that certain factors are considered too much or others overlooked altogether. Therefore, the list of scoring results internally at the partners' offices was handed

on to supervisors to go through them and double-check the project managers' takes on and assessments of the information at hand.

Regarding timeframes for the projects in consideration, it was decided to go back by not more than two years from the working timeframe (which was throughout 2025). Projects that had already been concluded were assessed and considered as potential lighthouse projects but only if they were not concluded before 2023. This was to ensure the contemporary relevance of the endeavours to be evaluated for the sake of competitiveness of enterprises in the Danube Region today, as challenges and their profiles have obviously changed significantly over the last few years. Some projects concluded before may have focused on challenges that are not of the most pressing interest for enterprises today. Still, for a basis that is as broad and multi-faceted as possible, it was still vital to not only include projects that were running momentarily.

A considerable number of lighthouse project managers/representatives did have to be contacted, as ten lighthouse projects per content-related focus field of action (see above) had to be identified in the end. In order to have a representative study that provides excellence in the sense of only presenting lighthouse projects that successfully passed the evaluation scheme and therefore fulfil the criteria to actually be a lighthouse project that is interesting for other stakeholders with relation to the Danube Region, a number at least four to five times as large as the final number of lighthouses had to be contacted (see above). This calculation was based on the experience that of course by far not all project representatives would actually react and give feedback. This allowed the consortium to make sure that no project will in the end have passed the assessment in a way that may be described as accidental.

Making this more comprehensible with a number, it can be stated that a total of more than 160 projects were in the end incorporated in the scoring grid, with only 30 of them decided in favour of.

4. CATALOGUE OF DANUBE LIGHTHOUSES

In this section, the list of Danube Lighthouses will be presented. The projects represent all EUSDR member countries including the two different German member regions Baden-Wuerttemberg and Bavaria. They cover a broad geographic as well as thematic scope.

The projects in these tables are ranked by the reached score based on the evaluation methodology outlined above (out of 50 points that were attainable in total). Please again note that this does not mean that the tables show all scored projects by the order of the number of points that were scored in each focus of action area, as some projects were excluded because higher-scoring projects from their countries were already included.

In a first stage of work in the process of study development, merely the lists of the projects were provided, further work on the study then focused on detailed descriptions of the lighthouses chosen for the study. The detailed process can be re-examined in chapter three.

The scores were not allocated for the total list of potential lighthouses, but by every one of the three thematic focus of action areas. This means that even though coming with a higher score, some projects may not have made it to the following list because the level of scores in another thematic field may have been higher.

4.1 GREEN TECH, CIRCULAR ECONOMY & CIRCULAR BIOECONOMY

Project No.	Name	Timeframe	Country	Score	Link
1	Innovation Hub CCU_{BIO} BW	2021-2024	Baden-Württemberg	50	Link
2	Neo-Eco Ukraine	2022-	Ukraine	48	Link
2	RECONOMY Program – Circular business models and resource efficiency in the textile and apparel industry	2024-	Moldova	48	Link
4	GreenTech BW Platform - Platform for future technologies and sustainable economy	2024-	Baden-Württemberg	45	Link
4	Empowering Central and Eastern European countries to develop circular bioeconomy strategies – CEE2ACT	2022-2025	Hungary (Coordinator), Bulgaria, Croatia, Czechia, Romania, Slovakia, Slovenia, Serbia, Austria, Germany	45	Link
4	CCRI pilot region Podravje	2022-2030	Slovenia	45	Link
7	Green Up Hub	2024-2026	Serbia	44	Link
7	Empowering bioeconomy projects by deploying Technical, Business, Regulatory and Social assistance services – ToBeReal	2024-2029	Slovakia, Slovenia	44	Link
7	Bioeconomy Cluster	2010-	Serbia	44	Link
10	Slovenian Center for Circular Economy	2025-2029	Slovenia	41	Link

4.2 DIGITALIZATION, ARTIFICIAL INTELLIGENCE, METAVERSE & VIRTUAL WORLDS

Project No.	Name	Time-frame	Country	Score	Link
1	Croatian Artificial Intelligence Association (CroAI)	2019-	Croatia	49	Link
1	Optimization of manufacturing and transportation infrastructure processes through artificial intelligence methods – OPTIMUM	2024-2026	Slovakia	49	Link
3	DIH AGRIFOOD Demonstration Farms	2023-	Slovenia	47	Link
4	Innovative system of virtual reality and simulated model cases of security character facilitating training and treatment of police officers in risky situations	2023-2025	Czech Republic	46	Link
4	Industry 5.0: Operator 4.0	2024-2026	Hungary	46	Link
4	Circular DigiBuild	2024-2026	Bulgaria (Coordinator), Austria, Czech Republic, Germany, Slovakia, Slovenia, Hungary, Romania, Bosnia & Herzegovina, Serbia, Montenegro, Croatia, Moldova	46	Link
7	Virtual Diagnostic Tool for Neurological Examinations – VIRADIA	2025-2026	Slovakia	45	Link
8	Cultivating Industry 5.0 Talents – CITADELS	2025-2029	Serbia (Coordinator), Slovenia, Hungary, Czech Republic, Austria, Bosnia & Herzegovina	43	Link
9	EuProGigant	2022-2025	Austria, Baden-Württemberg	41	Link
10	Creation, introduction and testing of digital tools in agriculture – DAP	2023-2024	Bosnia and Herzegovina	40	Link

4.3.1 SUPPLY CHAINS

Project No.	Name	Timeframe	Country	Score	Link
1	Master Study Programme Supply Chain Management, Logistics, Production – DHBW	2015-	Baden-Wuerttemberg, Bavaria	43	Link
1	global verantwortlich BW – Lieferketten nachhaltig gestalten	2021-	Baden-Wuerttemberg	43	Link
3	Digitalna firma - ONEX DIH Bosnia & Herzegovina	2023-	Bosnia and Herzegovina	41	Link
3	Supply Chain Intelligence Institute Austria – ASCII	2023-2028	Austria	41	Link
5	Rethinking Global Supply Chains: measurement, impact and policy – RETHINK-GSC	2023-2025	Hungary, Austria	39	Link

4.3.2 FINANCE

Project No.	Name	Timeframe	Country	Score	Link
1	KMU.DIGITAL & GREEN	2017-2026	Austria	47	Link
2	Enhancing MSEs sustainable Growth and Competitiveness – EmBRACE	2021-2027	Croatia, Bosnia & Herzegovina, Montenegro	46	Link
3	Slovene Enterprise Fund Vouchers	2019-2028	Slovenia	45	Link
4	Western Balkans Green Growth Alliance	2024-2026	Montenegro, Bosnia and Herzegovina, Serbia	43	Link
5	Interregional Funding Mechanism of the Vanguard Initiative – VInnovate	2024-	Romania, Austria	42	Link

5. PROJECT DESCRIPTIONS

5.1 GREEN TECH, CIRCULAR ECONOMY & CIRCULAR BIOECONOMY

5.1.1 INNOVATION HUB CCU_{BIO} BW

Overview

The Innovation Hub CCU_{BIO} BW was a regionally funded project (2021–2024) implemented by the regional circular economy agency Umwelttechnik BW and funded by the Baden-Württemberg Ministry for the Environment, Climate and Energy Sector.

It was established to position Baden-Württemberg as a leader in biotechnological CO_2 recycling. Its mission was to support the implementation of innovative technologies in industry, aiming at the creation of new business cases and models using CO_2 as a resource through biotechnological approaches — including the use of microorganisms or enzymes to transform CO_2 into valuable products such as chemicals, materials, or proteins. These efforts contribute to a circular carbon economy and circular bioeconomy and reduce reliance on fossil carbon.

Illustration 4: CCU_{BIO} Visualisation

The project plays a key role in implementing Baden-Württemberg's Strategy for a Sustainable Bioeconomy and advancing the vision of a circular bioeconomy, recognising the region's strong industrial base and excellent research landscape as key enablers of climate-oriented transformation. Through networking, stakeholder engagement, and practical tools, the project strengthened collaboration between science, industry, and policy. It significantly increased awareness, supported the initiation of research projects, and helped SMEs and start-ups by connecting them with industry partners to explore and develop new business models.

Even after the official end of the project, its activities continue — the network is growing, the topic remains present, and biotechnological CO_2 recycling is gaining further relevance in the industrial and

political landscape. This strongly replicable approach is the reason for CCU_{BIO} BW being chosen as an EUSDR PA 8 Lighthouse.

Activities

The overall aim of the project was to encourage and support the roll-out of biotechnological CO_2 recycling in Baden-Württemberg. Therefore, a main goal was to raise awareness for biotechnological CO_2 recycling. The project team identified the type of information companies required. Thus, three practical tools were developed:

- the CO_2 Recycling Tool BW;
- the Biological CO_2 Recycling Guide showcasing real-world examples;
- the Legal Study providing orientation for actors both in the industry and public sector.

Building on this, the project focused on the power of networking. More than 20 events were organised, including a field study trip to the Steelanol project in Belgium. This gave visitors from Baden-Württemberg the opportunity to see a working CO_2 fermentation plant and discuss the business model directly with the operators. Participants kept highlighting the trip as particularly valuable.

To address the legal challenges, a detailed Legal Analysis was carried out. It examines key barriers such as emissions trading and permitting procedures and provides concrete recommendations for both policymakers and project developers.

Finally, public communication ensured visibility. Media coverage and campaigns led to public discussions with diverse opinions, which was considered both relevant and stimulating by the project team and network actors alike.

Impact

The project Innovation Hub CCU_{BIO} BW made a measurable contribution to advancing biotechnological CO_2 recycling in Baden-Württemberg and beyond. It provided added value in four key areas:

- *Key area 1:* Practical tools for companies: With the development of the CO_2 Recycling Tool BW, a practical Guide and a Legal Study, the project delivered hands-on support for companies who wish to evaluate the feasibility of CCU projects covering technical, economic, and legal aspects.
- *Key area 2:* Transfer of best practice: Through workshops, networking events, and especially the visit of the Steelanol plant in Belgium, the project encouraged knowledge exchange. Participants experienced a running CO_2 fermentation plant and its business model, which helped reduce scepticism and increased openness towards implementation.
- *Key area 3:* Legal orientation and policy input: The Legal Study systematically addresses regulatory gaps, including emissions trading and permitting. It provides concrete recommendations for policymakers and was recognised as valuable input for future legislative development.
- *Key area 4:* Public and political visibility: The project achieved solid coverage and triggered public discussion. It reached a wide audience via newsletters, social media, and publications, helping to raise awareness and establish CCU_{BIO} as a relevant part of the bioeconomy and climate policy discourse in the region.

Methodology

The project was guided by a needs-driven development approach, ensuring that all tools – such as the CO_2 Recycling Tool and the Practical Guide – were created based on early input from companies and

experts. This helped guarantee their relevance and usability in real-world contexts. To foster engagement and knowledge exchange, more than 20 interactive formats were implemented, including workshops, webinars, and a study trip to the Steelanol plant, which also provided valuable networking opportunities.

The abovementioned comprehensive legal study conducted by a specialised law firm offered a structured review of the regulatory landscape. It identified key barriers to implementation and proposed practical recommendations to address them. To increase visibility and stakeholder engagement, the project employed a targeted communication strategy using video content, social media, press outreach, and a dedicated newsletter.

Throughout the process, iterative feedback loops were established, involving stakeholders and the funding authority in the co-development of all actions and outputs. This ensured that the project remained aligned with both practical industry needs and overarching political objectives.

Results and Outcomes

The Innovation Hub CCU_{BIO} BW achieved results that helped close gaps in knowledge, legal understanding and cooperation in the field of CO_2-based biotechnologies.

Instead of compiling strategies, the project focused on providing helpful tools:

- Companies now have access to a practical online-tool helping them explore CCU technologies that could be relevant to them.
- The Legal Study offers not only analysis, but also checklists and ideas for political decision-makers.
- The CO_2 Recycling Guide explains key facts and real examples in simple language, especially helpful for people new to the topic.

As per networking, the project built a small, but active community. The study trip to the Steelanol plant had a strong effect: it helped participants turn their interest into real project ideas. Some used it as a starting point to plan pilot projects or find partners.

In communication, the goal was not just visibility, but engagement. LinkedIn posts led to discussions, and the newsletter reached over 800 people.

The project proved that easy-to-use tools, legal clarity and real-life examples can help a topic move forward. However, to bring more projects into reality, ensure further support and funding, some changes are still required. The base has been established, but it needs to grow.

Barriers and Solutions

One key barrier was the lack of legal clarity for companies interested in CO_2 recycling. Actors were unsure how CCU projects comply with existing regulations, especially in emissions trading and permitting. It was also unclear how CO_2-based products are officially recognised and certified, which makes it difficult to plan investments or gain market access. The Legal Study helps address some of these questions with explanations and recommendations.

Another challenge was limited awareness and technical knowledge, especially among SMEs. To respond, the project developed low-threshold tools like the CO_2 Recycling Tool and a Practical Guide to make the topic more accessible.

A further issue was the lack of visible best-practice projects in Baden-Württemberg. At the moment, there is no lighthouse project in the area that actors can visit to learn directly from real-world experience. This limits hands-on understanding and slows down interest in implementation. The Steelanol site visit in Belgium helped fill that gap temporarily, but regional examples are still missing.

It became clear that successful CCU development requires strong and continuous networking. The group of actors must have a wide range: it needs enablers, policymakers, emitters, technology providers, plant engineers, and business developers at the same table. Without this variety, relevant perspectives and project success factors are missed.

Ideas for future Replication

Based on the experienced made with the implementation of CCUBIO BW, it should prove valuable to use a mix of simple workshops and informational events to inform companies, legal analysis based on national law, study trips to working CCU plants, and support for regional lighthouse projects.

This approach can easily be replicated in the countries of Danube Region. The Danube Region can benefit from the tools, formats, and lessons already developed in Baden-Württemberg and adapt them to their own regional context. This would save time, reduce uncertainty and accelerate CCU project development on a broader geographical scale.

Successful project development begins with listening closely to the real needs of companies and public actors. Rather than relying on complex strategies, it's often more effective to focus on small, practical steps that can be implemented quickly and adjusted as needed. Open communication plays a crucial role – critical voices should not be dismissed, as they often provide valuable insights that can improve outcomes. Legal and certification aspects should be considered early in the process to avoid delays and ensure compliance. Finally, networking must be inclusive of all relevant roles as only a broad and diverse group of stakeholders can drive CCU projects forward in a meaningful and sustainable way.

Summing it up, the project is innovative as it focuses on biotechnological CO_2 recycling, a still underdeveloped but high-potential solution, combines technical, legal, and communication tools in one package, and addresses both early-stage awareness and long-term transformation. It is sustainable because it creates knowledge and tools that can be reused beyond the project duration, supports circular carbon use in line with climate neutrality goals, and fosters long-term cooperation between business, research, and government. Although not a research project and not designed for scaling, the approach is easy to replicate, enabling other regions or federal states throughout and beyond the Danube Region to apply the same methods, formats, and tools and to benefit from the experience gained in Baden-Württemberg.

5.1.2 NEO-ECO UKRAINE

Neo-Eco Ukraine, as a sister company of Neo-Eco France, leads sustainable reconstruction and circular economy projects across Ukraine, supported by several EU and international funding sources. With 17 years of experience, the organisation combines eco-materials innovation, waste recycling, and community engagement, including rubble reuse, dual-use bomb shelters, and low-carbon construction.

Neo-Eco Ukraine transforms construction and industrial waste into low-carbon materials for Ukraine's recovery. The mission of the company is to promote sustainable development through eco-friendly practices and community engagement. It contributes to Ukraine's economic and environmental

sustainability by creating jobs and supporting local communities. Neo-Eco Ukraine has accumulated a lot of experience in the circular economy and eco-materials and is leading a range of sustainable reconstruction and community regeneration projects across Ukraine.

Among them is the signature project VALOBLAST, which is a circular economy project focused on valorising fluvial and marine sediments from the Odesa region for use in sustainable construction and post-war reconstruction. The innovative aspect of VALOBLAST lies in its transformation of contaminated or underused sediments into certified eco-construction materials, combining advanced material formulation with circular economy principles. Its scalable nature comes from the replicable, step-by-step methodology which can be applied in other port or river regions. The sustainable impact is achieved by reducing dependence on virgin raw materials, lowering CO_2 emissions, and fostering local green value chains, making the model both environmentally and economically viable for long-term adoption. All of these factors combined are strongly in the interest in Ukraine's recovery and also future collaboration prospects with the rest of the Danube Region, which is why Neo-Eco Ukraine, especially with the VALOBLAST project, has been chosen as an EUSDR PA 8 Lighthouse.

Funding

Neo-Eco Ukraine has benefitted from multiple funding sources including EU LIFE and HORIZON project funding, country agency funding including from Swedish Institute, Helvetas (Switzerland), Green Danida (Denmark), FASEP and Région Sud (France) and CPVA (Lithuania). They are also a member of the New European Bauhaus.

Main Activities and Objectives

The places where Neo-Eco Ukraine is leading sustainable reconstruction and community regeneration projects across Ukraine include Kryvyi Rih, Mykolaiv, Odesa, Chernihiv, Sumy and Dnipropetrovsk. With offices in Kyiv, Mykolaiv and France, they take a holistic approach to circular economy, including civic participation and capacity training in their projects. Studies and consultancy services include the issues of waste management, asbestos abatement and training, circular economy practices for schools, bomb shelters or other civil infrastructure, circular economy training, analysis of waste streams and recycling possibilities. Furthermore, Neo-Eco offers the following:

- Project Management Implementation: Design to build (bomb shelters, community spaces, schools), sustainable reconstruction, rehabilitation and repair of objects, specific projects (such as women's and veterans' centres, dual-use bomb shelters designed by/with children);
- Eco-materials: Biogas to energy, plastic for insulation, low-carbon cement, straw panels for insulation and additional potential eco-materials depending on the project/community.

Project examples:

- Rubble cleaning and re-use / recycling by war veterans
- Dual use bomb shelters for schools, where children are actively involved in the choice of the dual use and make the design / material choices
- Bio-sourced construction materials
- Low carbon cement demonstrator
- Reconstruction of the Zeleny Hai school and bomb-shelter
- Women and Children's Mental Health and Healing Centre

Illustration 5: Neo-Eco project activities

Methodology

Focusing specifically on the VALOBLAST Odesa project, the following methodology was used:

1. Quantify: Identify and estimate the volume of sediment deposits in the Odesa Oblast using GIS mapping and hydrological data. The goal is to locate key accumulation zones and assess a target volume of 50,000–100,000 m³ of potentially reusable sediment.
2. Sampling: Conduct representative sediment sampling at 3–5 strategic locations, including ports and river mouths. Each site will provide around 100 kg of material, collected using standardised coring and dredging techniques, ensuring compliance with safety and environmental protocols.
3. Analyse: Perform laboratory tests on the collected samples to determine their granulometry, contamination levels (heavy metals, hydrocarbons), moisture content, and mineral composition. Results will guide the classification of sediments for different valorisation pathways.
4. Formulate: Develop sediment-based material formulations using additives such as geopolymers or lime. The goal is to create 2–3 prototype products (e.g., bricks, road base layers) that are technically viable, eco-friendly, and compliant with EU construction standards.
5. Test: Pilot the use of sediment-based materials in small-scale constructions in Odesa. Technical evaluations will include compressive strength tests, leaching assessments, and a full Life Cycle Assessment (LCA) to quantify environmental performance and carbon footprint reduction.
6. Implement: Deploy the validated materials in real urban or infrastructure projects in Ukraine. This stage includes training local SMEs and construction teams and integrating sediment reuse into post-war green reconstruction programs.
7. Disseminate: Transfer project results and methodologies to Marseille through targeted dissemination actions, including two workshops involving port authorities and SMEs. Documentation and technical sheets will support replication in Mediterranean port ecosystems.

Impact

Neo-Eco Ukraine has been involved in over 20 projects since 2022, with 500,000 tons of debris recycled with a 95% overall recycle rate and five eco products designed and created.

A series of innovative reconstruction and sustainability projects across Ukraine are demonstrating how circular economy principles can support both environmental recovery and social resilience. The Hostomel Rubble Recycling Pilot showcased a scalable model for post-war reconstruction, saving over 1.700 tonnes of CO_2 and 135.000 € through eco-material reuse. In South Mykolaiv, veterans were employed in rubble cleaning, achieving a 95% recycling rate and fostering social reintegration. The Zelenyi Hai Green Modular School is building resilient infrastructure for children using local eco-materials, while TEPLO is retrofitting Soviet-era buildings with bio-based materials to improve energy efficiency and living conditions.

Complementing these efforts, the Asbestos White Paper and Laboratory is establishing Ukraine's first stationary lab for safe asbestos detection and removal, enhancing national health and safety capabilities. Finally, the Low-Carbon Cement and Green Concrete Project in Mykolaiv is pioneering climate-resilient construction materials, saving 80,000 tonnes of CO_2 annually and creating jobs for vulnerable groups. Together, these projects offer scalable, cost-effective solutions for sustainable rebuilding and community empowerment.

Summary and Outlook

The sustainable impact of the Neo-Eco Ukraine initiative, particularly through the VALOBLAST project, lies in its ability to reduce dependence on virgin raw materials, lower CO_2 emissions, and foster resilient local green value chains. This integrated approach makes the model both environmentally and economically viable for long-term adoption. These outcomes are especially relevant to Ukraine's recovery efforts and offer strong potential for future collaboration across and with the rest of the Danube Region. Because of its strategic relevance, practical innovation, and replicability, Neo-Eco Ukraine has been designated as a Danube Lighthouse under EUSDR PA 8 – serving as a leading example of how circular economy solutions can drive regional transformation, even under such difficult circumstances.

5.1.3 RECONOMY PROGRAM: CIRCULAR BUSINESS MODELS AND RESOURCE EFFICIENCY

Kicked off in 2024, the new initiative "RECONOMY Program: Circular business models and resource efficiency in the textile and apparel industry" that is being implemented in the Republic of Moldova aims to accelerate the transition toward a circular and resource-efficient textile and apparel industry in the Eastern Partnership (EaP) countries. Implemented under the RECONOMY Program, it combines policy advocacy, capacity-building, and digital tools. The core outcome is a multilingual e-learning course that equips businesses, educators, and young professionals with practical knowledge on circular business models, eco-design, EPR regulation, and sustainability reporting.

It is the first of its kind in the region to integrate digital education, policy alignment, and practical business transformation in the textile and apparel sector. These resource-intensive sectors and the enterprises operating within it are in particular demand of seeing new perspectives and therefore having circular business models encouraged that are in line with EU green and digital transformation priorities. The barrier-free, new information circulation approach that is being implemented by the RECONOMY

program is a valuable answer to this situation, which is why the project was identified as an EUSDR PA 8 Lighthouse.

Funding and Partnership

This initiative is part of the RECONOMY PROGRAM “Circular Business Models and Resource Efficiency for Competitiveness and Growth in the Textile & Apparel Industry in the EaP Countries” financed by Helvetas, SIDA and implemented by E-Circular, from 2024-2025, with possibility to continue.

The Moldova and Ukraine RECONOMY Eastern Partnership network is the one the project is situated within, with the E-Circular organisation being the implementor with the support of the abovementioned financial supporters. Furthermore, they cooperate with the textile cluster Sorintex.

Project Overview

The initiative aims to accelerate the transition toward a circular and resource-efficient textile and apparel industry in the Eastern Partnership (EaP) countries, with a focus on Moldova. Implemented under the RECONOMY Program, it combines policy advocacy, capacity-building, and digital tools. The core outcome is a multilingual e-learning course that equips businesses, educators, and young professionals with practical knowledge on circular business models, eco-design, EPR regulation, and sustainability reporting. The initiative supports competitiveness, reduces environmental impact, and fosters green skills in a high-impact sector.

The initiative is highly innovative as it is a pioneer in the region to integrate digital education, policy alignment, and practical business transformation in the textile and apparel sector. It introduces a multilingual e-learning tool tailored to circular economy principles, combined with the promotion of Extended Producer Responsibility (EPR) for textile waste – an emerging policy area in Moldova and the EaP region. By linking skills development, regulation, and sectoral competitiveness, the project creates a scalable model for systemic change in resource-intensive industries.

Project Focus

The project focuses on developing tailored educational resources for the textile and apparel industry by creating innovative courses and training materials that integrate eco-design principles, sustainable production methods, and efficient resource management. It aims to build green and circular skills among SMEs and professionals, helping them adapt to evolving sustainability standards, enhance competitiveness, and align with the green transition in the Eastern Partnership region. At the same time, it promotes circular economy practices and business models – such as reuse, recycling, and product longevity – to reduce environmental impact and support sustainable growth within the sector. A key priority is also to empower women and youth by providing access to decent work, entrepreneurial skills, and meaningful participation in the emerging green economy.

Activities and Impact

Through RECONOMY, E-Circular has introduced new learning opportunities and practical tools for SMEs and professionals in the textile and apparel sector, enabling them to better understand and apply principles of eco-design, sustainable production, and circular business models. The initiative has:

- Strengthened green skills of entrepreneurs and employees, contributing to a workforce more prepared for the challenges of the green transition.

- Encouraged cross-sector collaboration, connecting producers, designers, policymakers, and educational actors, which led to exchange of innovative practices and regional knowledge transfer.
- Contributed to the development of the Extended Producer Responsibility (EPR) regulation for textiles, laying the foundation for systemic change in waste management and circularity at national level.
- Carried out hands-on activities promoting reuse and repair, equipping schools and training centres with sewing machines and tools to establish local repair services, extend product life cycles, and involve young people directly in circular practices.

Illustration 6: E-Circular/RECONOMY Workshops

Methodology

So far, the methodology applied by E-Circular under the RECONOMY Program combined evidence-based policy development, targeted education, and practical demonstration activities. At the policy level, studies and stakeholder consultations were conducted to inform the drafting of the Extended Producer Responsibility (EPR) regulation for textiles, drawing on EU best practices while adapting them to the Moldovan context. In parallel, tailored learning resources and training modules were developed for SMEs and professionals in the textile and apparel sector, using interactive approaches such as case studies, examples of circular business models, and applied exercises.

At the practical level, the initiative emphasised hands-on implementation and community engagement. Schools and training centres were equipped with sewing machines and tools to establish reuse and repair services, while workshops encouraged the adoption of circular practices in real settings. This

integrated methodology ensured both systemic policy change and immediate, visible results for the textile sector.

Outcomes and Results

As of now, the RECONOMY initiative implemented by E-Circular has delivered both policy-level achievements and practical outcomes in the textile and apparel sector. At the regulatory level, the organisation contributed to the drafting of the Extended Producer Responsibility (EPR) regulation for textiles, a milestone that establishes a framework for systematic textile waste management and circularity in Moldova. This effort positions the sector closer to EU alignment and provides clarity for producers and policymakers.

On the educational and capacity-building side, E-Circular developed a new course and learning materials dedicated to sustainable practices in the textile sector, already used to train SMEs, students, and professionals. Beneficiaries have gained practical knowledge of eco-design, sustainable production, and circular business models, increasing their ability to integrate resource-efficient practices and strengthen competitiveness. Soon, the training will be also available on the Udemy platform in the English, Georgian and Romanian languages.

At the practical and community level, schools and training centres were equipped with sewing machines and tools, enabling them to establish repair and reuse activities that extend product life and create green learning opportunities for youth. Workshops and hands-on demonstrations raised awareness and showcased the feasibility of reuse and repair models, while also creating local services that benefit communities.

Barriers and Replication Tips

One of the main barriers faced was the low awareness of circular economy among SMEs, who often see sustainability as a cost rather than an opportunity. Another challenge was the lack of clear regulations for textile waste, which made it harder to engage producers, as well as the undervaluing of reuse and repair in schools and communities.

For future replication, the model of equipping schools with sewing machines and promoting repair/reuse can be easily scaled to other regions, while the EPR regulation for textiles can serve as a blueprint for other waste streams.

Main tips are always to combine policy with practice, invest in education and youth engagement, and build strong partnerships and success stories to inspire wider adoption. Circular transition takes time.

Conclusion

The initiative stands out as innovative because it combines two complementary tracks: on the one hand, policy work through the development of an Extended Producer Responsibility (EPR) regulation for textiles, which provides a strategic framework for the sector; and on the other hand, hands-on implementation through new learning resources, training for SMEs, and practical activities such as reuse and repair workshops. This dual approach – connecting regulatory change with concrete, on-the-ground solutions – is still rare in Moldova and shows a fresh way to accelerate the transition to circularity.

It is sustainable because it focuses on building lasting capacity and systems rather than short-term interventions. SMEs and professionals have gained green skills that will remain relevant as the market evolves, while schools and communities now have equipment and tools to continue offering repair and reuse services. At the same time, the initiative supports social sustainability by opening new

opportunities for women and youth and ensures environmental sustainability through reduced waste and more efficient use of resources.

The model is also highly scalable. The combination of a digital curriculum, practical toolkits, and multi-stakeholder partnerships can be replicated in other regions and in sectors such as retail, education, and community services. Moreover, the work on textile EPR provides a template that can be extended to other waste streams, creating a wider systemic impact. Because many of the resources are digital and modular, replication requires relatively low investment while delivering significant value. With practical, on-the-ground solutions, this initiative serves as a model comparatively easily replicable throughout the Danube Region, making it worthy of a PA 8 Lighthouse.

5.1.4 GREENTECH BW: PLATFORM FOR FUTURE TECHNOLOGIES AND SUSTAINABLE ECONOMY

Project Overview

GreenTech BW is a walk-in/regional support and connecting platform for companies interested in green technologies, specialised in start-ups, scientific organisations, ministries, clusters and more. Operational since 2024, it actively supports companies and key stakeholders in implementing GreenTech projects and enhancing the visibility of the industry in Baden-Württemberg.

The platform offers a wide range of services both online and in a face-to-face format: Through events, they enable industry players to exchange ideas, make new contacts and deepen their own knowledge or find out about the latest trends on the scene. With industry studies and market analyses, companies are supported in making well-founded strategic decisions. The GreenTech BW Atlas serves as a networking platform where suppliers and users can find their perfect match. The several initiatives enable industry players to work on joint projects across institutions. This wholesome approach and high visibility for a concrete offer to enterprises is the reason for GreenTech BW Platform being chosen as an EUSDR PA 8 Lighthouse.

Funding

GreenTech BW is funded by the Ministry of the Environment, Climate and Energy Sector Baden-Württemberg and the Ministry of Economic Affairs, Labour and Tourism Baden-Württemberg.

Main Activities and Objectives

GreenTech BW is aimed at users, providers and multipliers in the field of green technologies. To date, 24 partners and over 400 tech suppliers and users are part of the network, which is a central hub for all stakeholders in the field of green technologies in Baden-Württemberg:

- companies
- start-ups
- research institutions
- ministries
- associations
- and other multipliers.

GreenTech BW aims to strategically strengthen communication and public relations for the entire GreenTech sector in Baden-Württemberg. The platform is currently being set up and is gradually

developing into a central point of contact for providers, users and multipliers of green technologies. Among other things, GreenTech BW offers an online 'GreenTech BW Atlas' with an overview of technology providers, case studies from users for inspiration and information about multipliers and their respective offerings.

The online event series 'GreenTech BW TechTalk' is now in its third round and the current edition deals with the central question of how companies can make their use of water more resource-efficient, future-proof and economically sustainable. The online presence of the GreenTech BW platform is supplemented by a calendar of events that bundles relevant industry events. Offline, GreenTech BW promotes direct dialogue through network meetings, company visits and joint initiatives that address specific challenges.

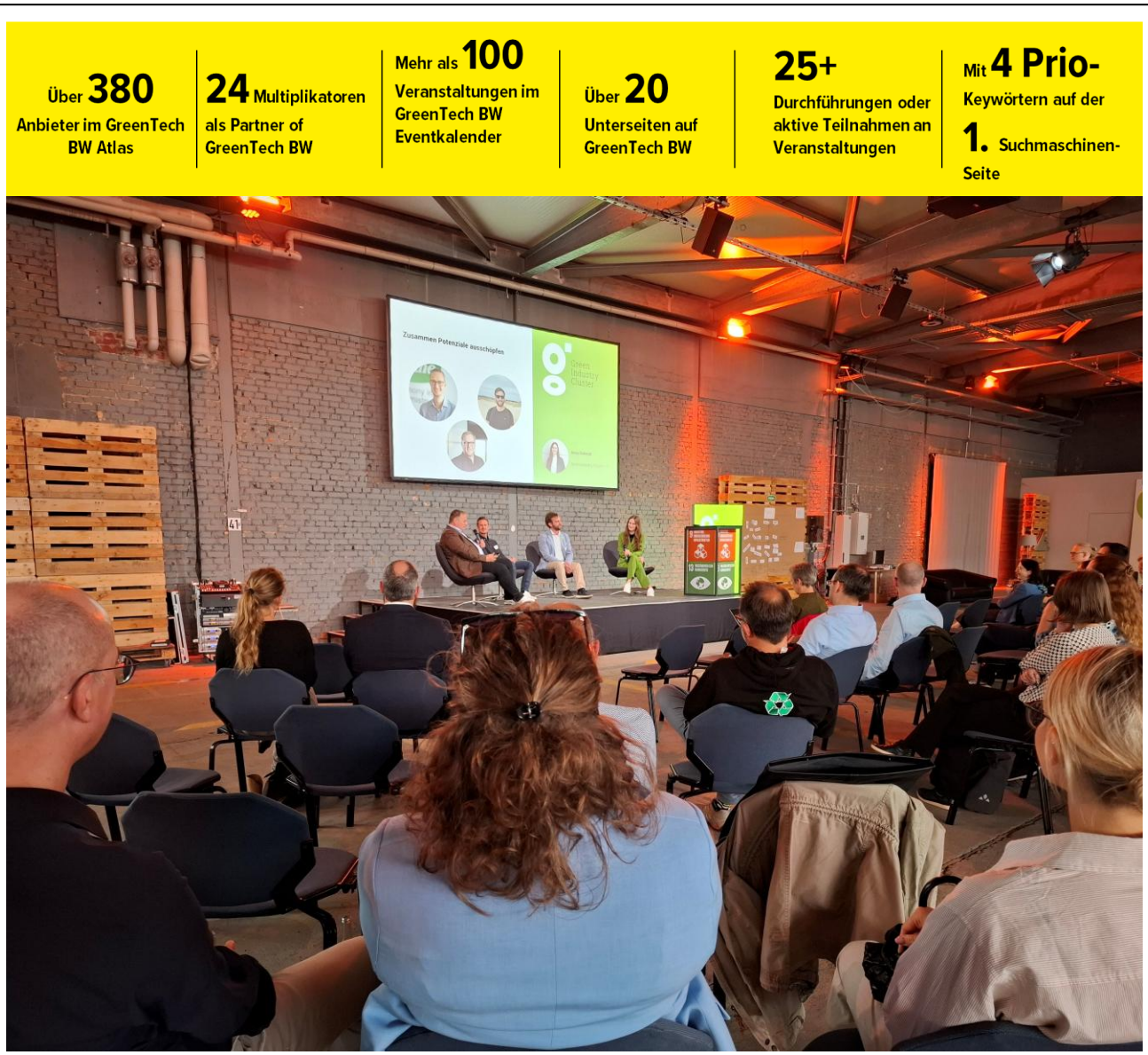

Illustration 7: GreenTech BW Figures and Events

Green technologies encompass a wide range of approaches, services, and solutions aimed at using resources more efficiently, making production processes more environmentally friendly, and protecting

our environment and climate. From renewable energies such as solar and wind power to smart waste and wastewater management and the utilisation of waste heat – the possibilities are nearly limitless. The aim is to accelerate the national and international implementation of GreenTech projects, making Baden-Württemberg a long-term centre of excellence – for an economy that is both economically and ecologically future-proof.

Methods

GreenTech BW provides industry studies and market analyses which enable companies to make well-founded strategic decisions. There are also a variety of offers available that make it possible to exchange ideas with industry experts, deepen your own knowledge or find out about the latest trends.

- Events: They provide industry players with opportunities to exchange ideas, make new connections, deepen their knowledge, and stay informed about the latest trends.
- Industry Studies & Market Analysis: They support companies in making well-informed strategic decisions.
- GreenTech BW Atlas: a networking platform where providers and users can find their perfect match.
- Collaborative Initiatives: Enabling cross-institution cooperation/joint projects within the industry.
- “Part of” or “Partner of” GreenTech BW: providers, adopters of green technologies, and environmental technology stakeholders can showcase their affiliation with GreenTech BW by requesting their logo and integrating it into their communication.
- GreenTech BW TechTalk: in compact one-hour sessions, experts will present pioneering technologies and best practices. Afterwards, participants are invited to discuss opportunities and challenges together, ask questions and share experiences.
- GreenTech BW event calendar: They provide the industry with project-specific and external events. The events section on the GreenTech BW website is relevant for the entire industry and provides orientation.

Impact, Challenges, Replication and Outlook

The GreenTech BW project is already having an impact on the industry: GreenTech players in Baden-Württemberg are beginning to see themselves as a cohesive industry and are specifically seeking to exchange ideas with one another. Established companies and start-ups are increasingly taking notice of the new platform – as shown by the continuously rising number of visitors. New partnerships and forms of cooperation are emerging in which established structures and innovative approaches complement each other profitably. GreenTech BW thus actively promotes synergies and creates points of contact that contribute to greater industry awareness and a growing mutual understanding.

Furthermore, participation in external events also increases visibility (e.g. at the Start-up BW Summit and KONGRESS BW). Social media templates are also a well-functioning communication tool that help to make GreenTech BW visible on social media.

- Over 380 suppliers in the GreenTech BW Atlas
- 24 multipliers as partners of GreenTech BW
- More than 100 events in the GreenTech BW event calendar
- Over 20 subpages on GreenTech BW
- 25+ events organised or actively attended
- With 4 priority keywords on the 1st search engine page

In terms of impact, the platform brought together multiple providers and users of technology and therefore accelerated the green transition. The challenges of the project include a lack of awareness of common challenges and opportunities in the sector, a lack of or unsuitable funding opportunities for entrepreneurial projects and an overall lack of awareness of belonging to a common sector.

The GreenTech BW Platform stands out as a lighthouse initiative within the EUSDR PA 8 framework due to its strategic impact on enterprise competitiveness and its exemplary approach to fostering green innovation. By offering companies direct access to regional support and a wide array of networking opportunities – whether they are seeking to supply, demand, or expand their green technology capabilities – the platform creates a dynamic ecosystem for sustainable industrial transformation. With over 400 technology suppliers and users already engaged, it demonstrates scale and relevance. Its holistic design, visibility, and tangible value for businesses make it set a benchmark for replication within the Danube Region and beyond.

5.1.5 CEE2ACT

The Horizon Europe project CEE2ACT (2022 – 2025) empowers countries in Central-Eastern Europe and beyond (Bulgaria, Croatia, Czech Republic, Greece, Hungary, Poland, Romania, Serbia, Slovakia and Slovenia) to develop circular bioeconomy strategies and action plans through innovative governance models. The project is coordinated by GENARDO in Hungary.

These objectives are achieved through establishment of national bioeconomy hubs and knowledge transfer from experienced countries – countries with a more advanced bioeconomy policy (Austria, Belgium, Finland, Germany, Spain, Sweden, The Netherlands). The project provides a set of national-level roadmaps for the bioeconomy strategies in the target countries that will be a result of the

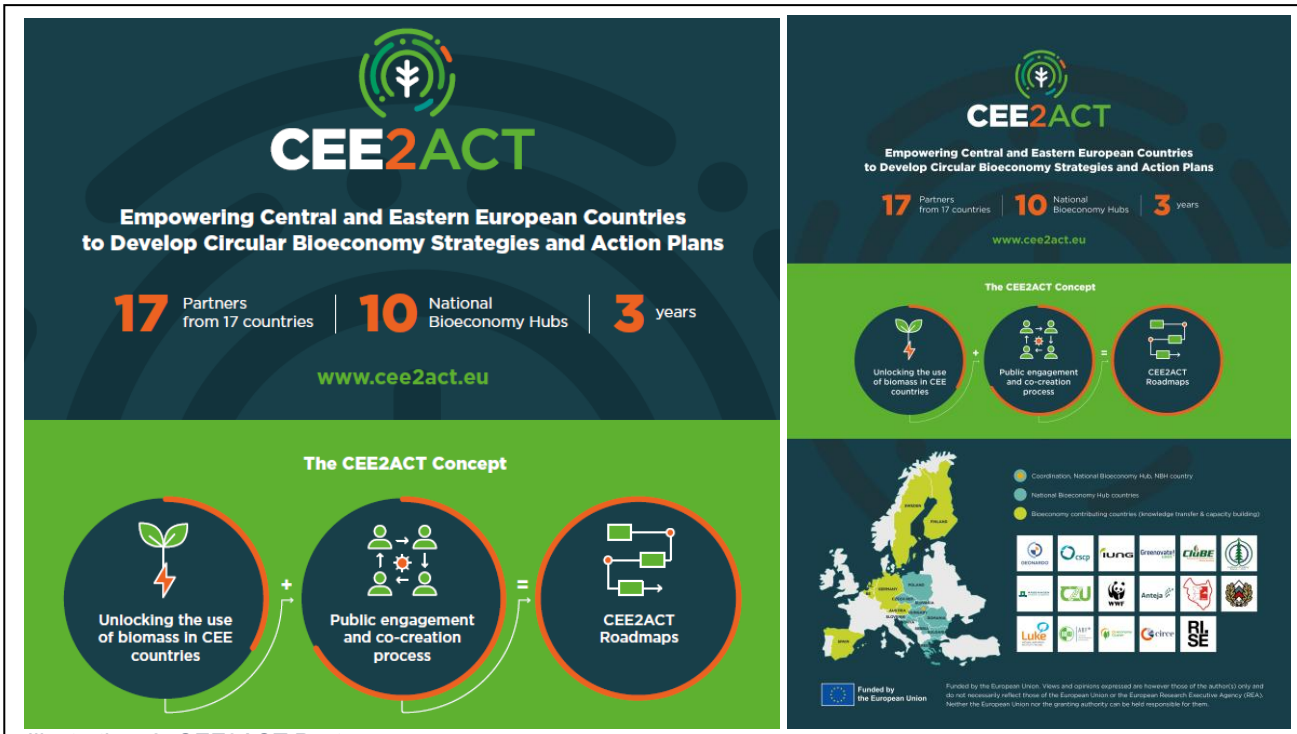

Illustration 8: CEE2ACT Posters

participatory bottom-up approach. The project is rooted in such a participatory approach and builds sustainable structures – hubs that trigger the strategic embeddedness of bioeconomy in CEE (Central and Eastern Europe) countries that are lagging behind in the bioeconomy development.

Project Activities

The CEE2ACT project's activities and objectives are designed not only to build capacities in the target countries (Hungary, Poland, Greece, Serbia, Czechia, Slovenia, Croatia, Slovakia, Bulgaria, Romania) but also to ensure a long-term impact through institutional anchoring, policy integration, and community engagement. The most important are empowering CEE countries to develop bioeconomy strategies and action plans, using a bottom-up approach, tailored to their specific socio-economic and environmental conditions. This involves transferring knowledge and best practices from experienced countries (Austria, Finland, Germany, Netherlands, Belgium, Spain, Sweeden) to those in Central and Eastern Europe (CEE), and supporting the design of inclusive, stakeholder-based strategies; and establishing national bioeconomy hubs as platforms for collaboration among stakeholders from academia, industry, civil society, and government. These hubs facilitate multi-actor engagement and co-creation of strategies.

- Creating a set of practical tools, guidelines, templates, and methodologies for bioeconomy policy design and implementation, which compiles practical resources and guidelines to help countries develop and implement effective bioeconomy strategies.
- Developing a Knowledge Transfer Mechanism to foster learning, cooperation, and networking among countries. This includes peer-to-peer exchanges, thematic workshops, and study visits to an experienced country (Netherlands).
- Producing National Bioeconomy Roadmaps, including country-specific SWOT analyses, stakeholder mappings, and action plans that outline strategic priorities, implementation steps, and monitoring frameworks.
- Focusing on inclusivity and participatory approaches, with a strong emphasis on involving stakeholders from different regions, sectors, and societal groups to ensure that the bioeconomy transition is just and equitable.

Added Value

CEE2ACT brings substantial added value by enabling Central and Eastern European (CEE) countries to transition from fragmented efforts to structured, inclusive bioeconomy strategies. Its impact lies in bridging knowledge and policy gaps through the transfer of proven governance models and best practices from experienced countries to CEE target countries. Additionally, empowering national stakeholders by establishing National Bioeconomy Hubs that foster multi-actor collaboration, ensure societal engagement, and integrate perspectives from farmers, foresters, SMEs, researchers, NGOs, and policymakers.

It also fosters institutional capacity building through training, digital tools, and participatory processes, enabling countries to prepare and implement resilient bioeconomy strategies. Creating national-level roadmaps that align with EU priorities while reflecting local contexts is another added value, as well as catalysing innovation and sustainability by boosting cross-sectoral dialogue, unlocking the potential of biological resources, and promoting inclusive green growth across rural and urban areas. And finally, encouraging long-term policy uptake through bottom-up approaches, helping national administrations move from isolated initiatives to integrated, sustainable development planning.

Methodology

CEE2ACT applies a bottom-up, participatory, and multi-actor methodology designed to empower CEE countries in developing circular bioeconomy strategies. The core methodological elements include knowledge transfer and inspiration, baseline assessment, stakeholder engagement, co-creation and mutual learning, development of practical tools, roadmap design framework and digital solutions.

CEE2ACT utilises successful examples from experienced countries to inform CEE countries through tailored exchanges, workshops, and learning formats. It also conducts comprehensive analyses of socio-economic and environmental contexts to map bioeconomy potential, gaps, and country-specific needs. By organising inclusive participatory processes through National Bioeconomy Hubs, it engages a wide range of actors (government, academia, private sector, NGOs, farmers, foresters, and civil society).

Applying interactive co-creation methods and peer-to-peer learning, CEE2ACT ensures that strategies are context-relevant and built on shared knowledge. It designs dedicated practical tools that provide guidance, templates, and resources for policy development, stakeholder involvement, and implementation. It also syntheses findings into country-specific roadmaps that include stakeholder mappings, SWOT analyses, strategic priorities, and implementation pathways. By developing digital tools, it supports transparent, inclusive, and sustainable governance in the design and monitoring of bioeconomy policy.

In one sentence, this multi-layered methodology ensures that the project is adaptable, scalable, and capable of fostering durable and inclusive policy outcomes.

Results and Outcomes

CEE2ACT is designed to deliver strategic and practical results that directly support the development of circular bioeconomy strategies in CEE countries.

Key results and outcomes are:

- Baseline analyses of bioeconomy in each country: Comprehensive assessments were conducted to map the current state of the bioeconomy in each CEE2ACT target country, identifying key actors, existing policies, biomass potential, and main barriers and opportunities. These analyses served as a foundation for informed strategy development.
- Establishment of National Bioeconomy Hubs: Functional, multi-actor platforms in each participating country that bring together stakeholders from government, academia, industry, agriculture, forestry, and civil society to foster coordination and co-creation.
- Enhanced capacities and knowledge transfer: Through targeted training, peer-learning activities, and study visits to experienced countries, stakeholders have improved their understanding and capabilities for bioeconomy development.
- Development of the CEE2ACT Digital Tools: Introduction of 4 digital solutions for more transparent, participatory, and data-informed governance of the bioeconomy sector. These tools include a comprehensive set of practical resources such as templates, guidelines, and best practices to support strategy development, stakeholder engagement, governance models, and policy implementation.
- National Bioeconomy Roadmaps: Tailored roadmaps co-created with stakeholders in each target country, containing strategic objectives, priority actions, and implementation mechanisms aligned with EU bioeconomy goals.

- Memorandum of Understanding: Formal agreements will be signed among key national stakeholders to ensure institutional commitment and sustainability of the National Bioeconomy Hubs beyond the project's duration.

Illustration 9: CEE2ACT Roadmap

CEE2ACT has significantly strengthened the institutional and stakeholder capacity of CEE countries to transition toward a circular bioeconomy. The project established sustainable national-level structures and provided practical methodologies for designing inclusive strategies. By embedding mutual learning, co-creation, and digital innovation, CEE2ACT ensures that its outcomes will have a long-term impact.

Barriers and Replication Tips

CEE2ACT tackled several systemic and operational barriers. Lack of institutional coordination, where many countries lacked cross-sectoral collaboration and clear governance structures, was one of them. CEE2ACT addressed this by establishing National Bioeconomy Hubs as formalised multi-actor platforms. Another challenge was insufficient data and fragmented knowledge. However, the baseline analyses helped close key knowledge gaps by providing structured overviews of national bioeconomy landscapes, including biomass potential, policy context, and stakeholder ecosystems. Initially, low stakeholder awareness and engagement were perceived as a problem. The project implemented inclusive engagement methodologies, training, and workshops to raise awareness and empower actors across sectors. Another barrier was also a default top-down policy approach. CEE2ACT introduced bottom-up, participatory co-creation processes, allowing national strategies to be informed by real needs and local knowledge. In some countries, limited access to best practices was noted. However, the CEE2ACT project fostered knowledge transfer from experienced countries, reducing the isolation of CEE stakeholders from successful models and experiences elsewhere in Europe.

Ideas for future replication include adopting the CEE2ACT model of National Bioeconomy Hubs in countries beyond the project as a mechanism for ongoing stakeholder coordination, consultation, and

innovation in bioeconomy governance. The CEE2ACT 'Toolbox' could also serve as a practical resource for other regions revising or designing their bioeconomy strategies, particularly in the Western Balkans, Eastern Partnership, or Mediterranean. In addition, scaling the baseline analysis methodology to other thematic areas (such as blue or urban bioeconomy) or to subnational levels (e. g. regional development plans) could provide further benefits. Finally, extending the use of digital tools to enhance monitoring, data access, and citizen participation in bioeconomy policy development offers strong potential for replication.

Sustainability, Replicability and Scalability

The project's sustainability is ensured through strong policy anchoring. Roadmaps are developed in alignment with EU strategies, securing their long-term relevance and continuity. Memoranda of Understanding and other formal commitments reinforce stakeholder ownership, helping to guarantee that hub activities continue beyond the project's official lifetime. At the same time, CEE2ACT invests in capacity building and knowledge transfer, equipping national actors with the skills needed to design, implement, and adapt bioeconomy strategies over time. This combination of policy alignment, institutional commitment, and skills development makes the outcomes resilient and durable.

The approach is also designed with transferability in mind. Its modular methodology – beginning with baseline analysis, followed by the creation of hubs, and culminating in the co-creation of roadmaps – offers a structure that can be replicated in other EU macro-regions, such as the Western Balkans or the Eastern Partnership countries. The 'Toolbox', together with digital solutions and the roadmap framework, can be adapted to different governance levels or sector-specific contexts, such as blue or urban bioeconomy. The inclusive, multi-actor model ensures relevance across diverse political and economic systems, making it suitable not only within the EU but also beyond.

Long-term Impact and Outlook

Through this combination of participatory governance, institutional innovation, strong policy alignment, and adaptable methodology, CEE2ACT creates a solid foundation for both immediate impact and long-term transformation of bioeconomy governance.

Comprehensive impact is expected in the long term and well after project termination when the previously defined strategies will be adopted and implemented. The project is rooted in a bottom-up participatory approach and aims at building sustainable structures in the form of hubs that trigger the strategic embeddedness of bioeconomy in CEE countries that are lagging with regard to their bioeconomy development. This structure of course comes with a high potential for replication and is, by beneficial adaption access, in the interest of the competitiveness of enterprises in the Danube Region, which is why CEE2ACT has been chosen as an EUSDR PA 8 Lighthouse.

5.1.6 CCRI PILOT REGION PODRAVJE

Funding and Partnership

Under the framework of the EU Circular Cities & Regions Initiative (CCRI), Podravje in Slovenia was chosen in 2022 as one of the pilot regions of the framework. Within the project, a regional bioeconomy strategy for the region of Podravje based on regional data was prepared. In this region strongly shaped by agriculture, the base was to develop solutions based on available material sources/streams on scene

in order to help stakeholders to deal with them and create new solutions that can involve even more stakeholders.

CCRI is a flagship initiative of the European Commission under the Circular Economy Action Plan, designed to support cities and regions in accelerating their transition to a circular economy. By focusing on areas such as waste, water, energy, mobility, construction, and public procurement, CCRI helps local and regional authorities develop circular economy strategies and implement practical solutions.

With CCRI support, the pilot region Podravje project will run until the end of 2025, but the strategy and action plan they have developed will extend to 2030. The application was prepared jointly by E-zavod and RDA Podravje Maribor, with RDA Podravje acting as coordinator due to its mandate for regional development in Slovenia. E-zavod focused on the content of the proposal. As the project has progressed, the number of active stakeholders has grown, with many playing an important role in shaping the strategy and an even stronger role in preparing the action plan.

Main Objectives

The main goal 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 bio-degradable materials. E-zavod supports communities and companies in the transition to a circular economy through cooperation with RDA Podravje Maribor in the European Commission's CCRI, where Podravje was chosen as one of the twelve pilot communities committed to the transition to circular economy – in this case bioeconomy with the expert support of the European Commission.

Illustration 10: CCRI Podravje

In cooperation with different actors and networks in the Podravje region, RDA Podravje – Maribor and E-Institute are developing and implementing a circular systemic solution, which is outlined in the action plan of the Regional Strategy for Transition to Circular Bioeconomy of Podravje 2030. This strategy is the first regional-level strategic document of its kind to be adopted in Slovenia.

In the process, they designed several circular system solutions (CSS) in the field of bioeconomy, such as the circular production of fertilisers, the use of river sediments, the use of purified wastewater in agriculture, and more.

Methodology

For the project implementation, the CCRI methodology was applied, which provides users with a clear and structured framework for developing a circular economy strategy. The process was easy to follow, highly practical, and ensured that all relevant steps – from stakeholder engagement to action planning – were well guided. The experience of the consortium with it has been very positive, as it helped them bring diverse actors together and translate ideas into concrete actions. The full methodology can be explored here.

Main Activities

The consortium prepared the strategy for bioeconomy in the region of Podravje based on regional data – almost 70% of the land in the region is dedicated for agriculture and they have a large river in the region (the Drava River with eight hydropower plants and accumulation lakes). Their base was to develop solutions based on in region available material sources/streams to help stakeholders to deal with them and create new solutions that can involve other stakeholders. They also looked at possible upgrades in food production since with all given available land, the region and Slovenia in general are not self-sufficient in vegetables production. Based on stakeholders' response and their active role in the whole process, one can be confident that activities will continue and projects that are listed in the action plan will be implemented.

Results and future-directed Outcomes

The pilot project for reuse of cleaned waste water is ongoing within the Horizon Europe project Circsyst, they have used the program's Green assist for preparation of implementation of a project for fertilisers and they are currently developing a greenhouse project for vegetables production with the use of geothermal energy based on previous experiences.

Impact

The proposed circular systemic solution aims to reduce the use of drinking water in agriculture, and enhance local food production, making the region more self-sufficient. This solution will also help reduce the region's carbon footprint and increase the availability of biomass as a regional resource. Furthermore, it will improve soil quality for farming and facilitate the extraction of phosphorus through pyrolysis, to be used in bio-based products like fertilisers.

Barriers and Replication Tips

Data collection was and will always continue to be a challenge. Furthermore, part of the legislation will have to be adjusted to enable use of some materials (end of waste legislation). Last but not least, project preparation for financial instruments was high on the list of barriers for the consortium.

Based on the use of the CCRI methodology, their process can quite obviously be replicated but not copied since other regions will have different starting points and materials available.

Conclusion and Outlook

The project applied the previously prepared methodology by CCRI and implemented it successfully. Even though the lifecycle of this project has come to an end already, a pilot application of cleaned

wastewater is ongoing, and also further project ideas stemming from the CCRI pilot region phase in preparation for future project applications, showing the longevity of the project results. Pilot regions on the local level can use and include SME contacts on a basic level, which is why the CCRI initiative, also considering its focus on the utilisation of endogenous regional bioeconomy potentials, overall is a model that is replicable for many EUSDR regions in order to reach companies directly for these frameworks, which is why it is a best practice and an EUSDR PA 8 Lighthouse.

5.1.7 GREEN UP HUB

Funding and partnership

ICT Hub in Serbia, as an implementing partner for the GIZ Green Economy project, has launched GreenUp Hub, a platform dedicated to green technologies. The hub was kicked off in 2024 and is running, for the current period, until 2026. It partners with Yale University under the UNIDO-led Global Green Chemistry Innovation and Network Program (GGCINP), funded by the Global Environment Facility (GEF), to implement the Greentech Accelerator.

Overview

The general objective of the GreenUp Hub project is to build capacities for green innovation and set the ground for the development of a Greentech ecosystem in Serbia. Main activities so far include the Greentech scoping analysis which assessed the Greentech ecosystem using the Technology Innovation System and Technology Readiness Level frameworks. It showed that the ecosystem, in Serbia at this point in time, was at the early stage of maturity, with fragmented coordination, limited commercialisation pathways and underused research capacity.

Following up on that, the Green Up Hub came up with a multi-factor strategy based on the lacks and barriers it identified, consisting mainly of a Greentech accelerator with open innovation challenges, a digital platform for research-industry collaboration and a Greentech marketplace, a Greentech investment fund, the development of green industrial policy as well as a general Greentech Balkan alliance. The targeted capacity building that Green Up Hub will tackle based on this analysis will directly target the competitiveness of enterprises in the Danube Region, as the project will attempt to target founders/potential founders with the knowledge and skills necessary for commercialising their technologies and developing self-sustainable businesses – this is the reason why Green Up Hub functions as an EUSDR PA 8 Lighthouse.

The Green Up Hub project has a mission to build capacities for green innovation and set the ground for the development of a Greentech ecosystem in Serbia. The ecosystem is composed of different actors, networks and institutions which play important roles in the development and diffusion of innovative green technologies as well as in raising awareness of SMEs about the benefits of adopting green technologies.

Activities and Methods

ICT Hub so far implemented the Greentech scoping analysis which assessed the Greentech ecosystem using the Technology Innovation System and Technology Readiness Level frameworks. It showed that the ecosystem was at the early stage of maturity, with fragmented coordination, limited commercialisation pathways and underused research capacity. Key barriers include insufficient

financing, regulatory uncertainty, low market readiness and weak infrastructure for piloting new technologies.

This study provides the first comprehensive analysis of Serbia's green technology ecosystem. As Serbia aligns with EU climate and industrial policies, developing a domestic Greentech sector is both necessary and economically strategic. The research mapped 151 Greentech providers, mainly in precision agriculture, circular economy, and digital energy solutions. The innovation system's overall performance is moderate, with knowledge sharing working best and market development weakest.

Illustration 11: Green Up Hub Study Header

Key challenges include fragmented funding, weak market incentives, limited public awareness, and insufficient collaboration between research and industry. Many solutions are still at the pilot stage, though nearly half of the surveyed companies have fully commercialised technologies.

To accelerate Serbia's green transition, the study recommends seven interventions: a dedicated Greentech accelerator with open innovation challenges, a digital platform for research-industry collaboration and a Greentech marketplace, a Greentech investment fund, the development of green industrial policy as well as a Greentech Balkan alliance.

In summary, Serbia, based on the study results and their practical implications, has a solid foundation for Greentech, but the ecosystem is young and poorly coordinated. The proposed measures offer a roadmap to strengthen innovation, increase market uptake, and boost competitiveness in line with EU standards. However, the study shows that Serbia's green technology innovation system has a promising growth potential and to this end, the integrated and mutually reinforcing interventions mentioned above are proposed.

Focusing on other project activities, the Greentech Accelerator is designed to empower solution providers through a structured and impactful program. It begins with the development of a tailored program concept, including curated activities for participants. An open call invites applications, followed by a transparent selection process based on defined criteria. Once selected, participants engage in a dynamic program featuring educational events, networking opportunities, and personalised mentorship. The journey culminates in a demo day, where participants showcase their innovative solutions to potential partners, investors, and stakeholders – creating visibility and momentum for green technology entrepreneurship.

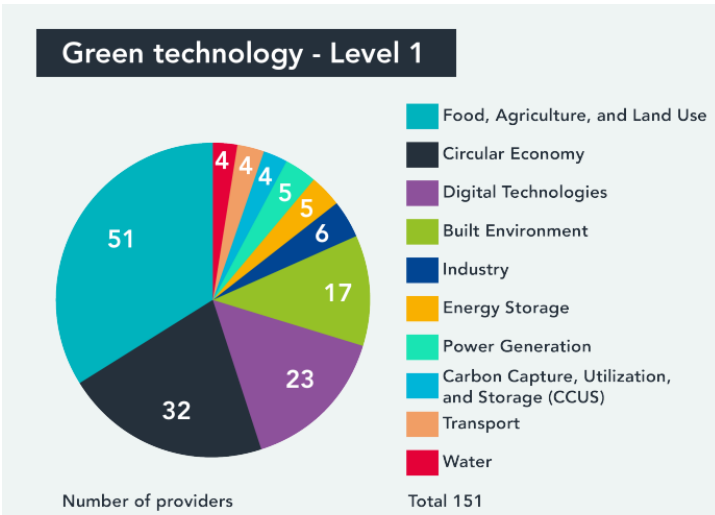

Table: Distribution of Serbian greentech solution providers across Green Technologies Level 1

Technology - Level 1	Technology - Level 2	Number of Providers
Food, Agriculture, and Land Use	Precision Agriculture	27
Circular Economy	Recycling Technologies	12
Circular Economy	Resource Optimization	12
Digital Technologies	Energy Management	10
Food, Agriculture, and Land Use	Livestock Emission Reduction	6
Food, Agriculture, and Land Use	Regenerative Agriculture	6
Built Environment	Heating and Cooling	5
Built Environment	Thermal Insulation	5
Digital Technologies	Resource Optimization	5
Food, Agriculture, and Land Use	Nature-Based Solutions	5

Table: Top 10 Green Technologies Level 2 represented among Serbian greentech solution providers

Illustration 12: Greentech solution providers

Furthermore, they created a Greentech platform, which is an online space focusing on Greentech solutions and collaboration between research and industry – allowing stakeholders to find providers and demanders of new solutions.

In preparation, the TIS (technological innovation systems) and TRL (technology readiness level) frameworks were used for the Greentech scoping analysis through interviews and mapping Greentech subjects.

Impact

The project activities will enhance the competitiveness of Greentech companies through targeted capacity building projects aimed at equipping founders with the knowledge and skills necessary for commercialising their technologies and developing self-sustainable businesses.

Green Up Hub aspires to make the green transition a cornerstone of sustainable economic growth by driving systemic change, empowering local innovators and fostering stronger collaboration between academia, industry and the public sector.

Conclusion and Outlook

Green Up Hub has been designated as an EUSDR PA 8 Lighthouse initiative due to its strategic, multi-dimensional approach to strengthening enterprise competitiveness in the Danube Region. Building on

a thorough analysis of existing gaps and barriers, the project has developed a comprehensive strategy which comes with an integrated framework that directly addresses the needs of founders and potential founders by equipping them with the skills and knowledge required to commercialise green technologies and build self-sustaining businesses. Its targeted capacity-building efforts and systemic impact make Green Up Hub a model of innovation and transformation – setting a precedent for similar initiatives in the Danube Region.

5.1.8 TOBEREAL

Partnership and Funding

ToBeReaL – Empowering bioeconomy projects by deploying Technical, Business, Regulatory and Social assistance services – is a Horizon Europe project coordinated by PNO Innovation SL (Spain), with activities and project partners in Slovakia and Slovenia. It runs from 2024 to 2029 under the European Research Executive Agency, funded through the call HORIZON-CL6-2024-CIRCBIO-01 (Coordination and Support Actions). ToBeReaL aims to promote and support the development of bioeconomy projects across Europe, with a particular focus on underdeveloped regions, including many in the Danube Region. Its goal is to overcome obstacles and create flagship projects that represent innovative and sustainable biological solutions. This wholesome approach increases the visibility of the potentials of bioeconomy applications which is in the direct interest of future competitiveness of enterprises in the Danube Region – therefore, ToBeReal was chosen as an EUSDR PA 8 Lighthouse.

Project Activities and Objectives

ToBeReaL is designed to empower bioeconomy projects through a strategic support framework spanning four key dimensions: Technical (T), Business & Financial (B), Regulatory & Legal (R), and Social Innovation (S). The project's core objective is to boost the readiness and scalability of at least 30 bioeconomy projects across Europe, with a strong focus on underdeveloped and transition regions.

The main objectives and activities of the project are:

- Identification of future needs, barriers and enablers to formulate strategies aimed at enhancing the competitiveness of novel bioeconomy projects across EU regions and facilitating the transition from a fossil-based to a bio-based economy – resulting in open reports on EU bioeconomy regions and various aspects of their developments.
- Support to bioeconomy projects by addressing the readiness levels that hamper their feasibility and scalability – providing a specialised portfolio of services in the Technical, Business and Financial, Regulatory and Legal, and Social verticals of assistance to be applied along 5 years, including long-term support.
- Attracting bioeconomy stakeholders via the community platform, targeted webinars, feedstock workshops and BioPitch Forums and fostering networking with multi-actors in the bioeconomy sector.
- Fostering the long-term growth of projects by actively ensuring their progression towards flagship status, with a particular focus on regions where bioeconomy is currently underdeveloped.

ToBeReal aims to support at least 30 projects with its assistance services and 10 of these projects should become flagship, which has a clear impact on the development of bioeconomy. The focus is on underrepresented regions, making the project even more impactful in the regions with the highest need.

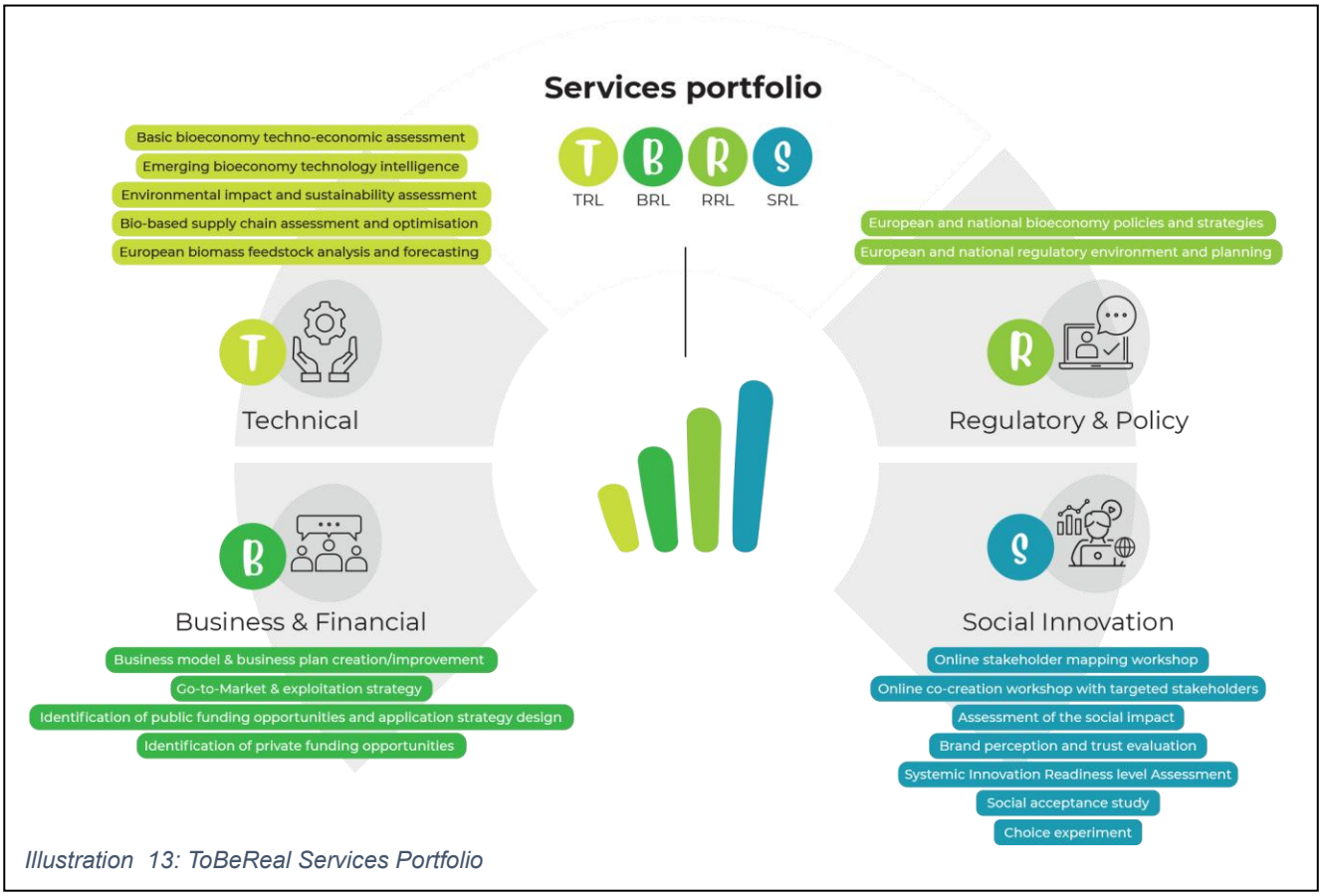

Illustration 13: ToBeReal Services Portfolio

Impact

The ToBeReaL project contributes to bioeconomy development by:

- Creating high-quality new knowledge in strategies and methodologies to enhance the positioning of bioeconomy projects, focusing on widening (e. g. Danube Region) countries and target regions across EU, thus enhancing the readiness and innovation capacity of bioeconomy projects;
- Engaging local communities and stakeholders through a multi-actor approach and fostering diffusion of knowledge and Open Science;
- Strengthening the uptake of research and innovation in society through the enhanced visibility of bioeconomy assisted projects and associated stakeholders;
- Leveraging investment in research and innovation by strategic assistance and creation of multi-actor partnerships;
- Promoting circular transitions, especially in less-developed regions;
- Creating new jobs and markets in the bio-based economy;
- Improving the visibility and impact of supported projects, many of which are on track to achieve flagship status.

Methodology

ToBeReaL follows a five-phase holistic methodology, which's steps are based on the results of each other:

1. Needs and barriers assessment – Identifying challenges in technological, regulatory, financial, and social domains;
2. Framework setup – Creating protocols and a service portfolio aligned with four verticals (T, B, R, S – for details, see the illustration above);
3. Project evaluation & assistance – Continuous open call and a rigorous readiness level (RL) assessment;
4. Stakeholder engagement – Inclusive participation through workshops, webinars, and forums;
5. Long-term assistance – Continuous mentoring, strategic roadmaps, and platform-based networking to achieve flagship outcomes.

Results and Outcomes

The project was launched in November 2024 and the main outcomes achieved so far include the following points:

- Identification of the future needs and barriers across European regions – inventory of technological roadblocks, barriers related to demand side of bio-based products, regulatory barriers, opportunities related to social innovation aspects.
- Design of service portfolio in four verticals – ToBeReaL provides comprehensive assistance with a particular focus on the critical areas where innovative initiatives often encounter challenges in scaling effectively.
- Launch of the application mechanism offering tailored support services to bioeconomy projects – with up to 60 ToBe Coins, the beneficiaries have a chance to choose their own mix of services from four high-impact areas.
- Populating ToBeReaL project by feedstock workshop – six strategic thematic workshops will be organised by the clusters involved in ToBeReaL. The first took place in May 2025 in Slovakia and it was focused on bio-based materials of the future, and it attracted more than 50 participants from the international bioeconomy community.
- Bioeconomy nurturing webinars – state-of-the-art specific webinars focused on the four verticals. The first one within technical vertical was organised in June 2025 and the topic was Navigating through technical challenges of scaling up within the bioeconomy.

Barriers and Replication Tips, Outlook

As the project is at its early stages of implementation, no significant barriers have been encountered so far. The main concerns may include low stakeholder participation in some regions, the risk of an insufficient number of project applications in early stages of the call, and technical complexity in tailoring assistance services to diverse needs.

ToBeReaL supports the development of bioeconomy projects across Europe, with a strong focus on underdeveloped regions such as some in the Danube Region. It provides tailored four-dimensional assistance – technical, business and financial, regulatory and legal, and social innovation – that goes beyond technical solutions to address systemic challenges. By helping projects strengthen business models, access finance, and connect with partners, ToBeReaL enables them to scale up and become flagship initiatives. Its approach is designed to be innovative, sustainable, and replicable, combining long-term mentoring, regional empowerment, and an open-access platform to accelerate bioeconomy transitions across Europe.

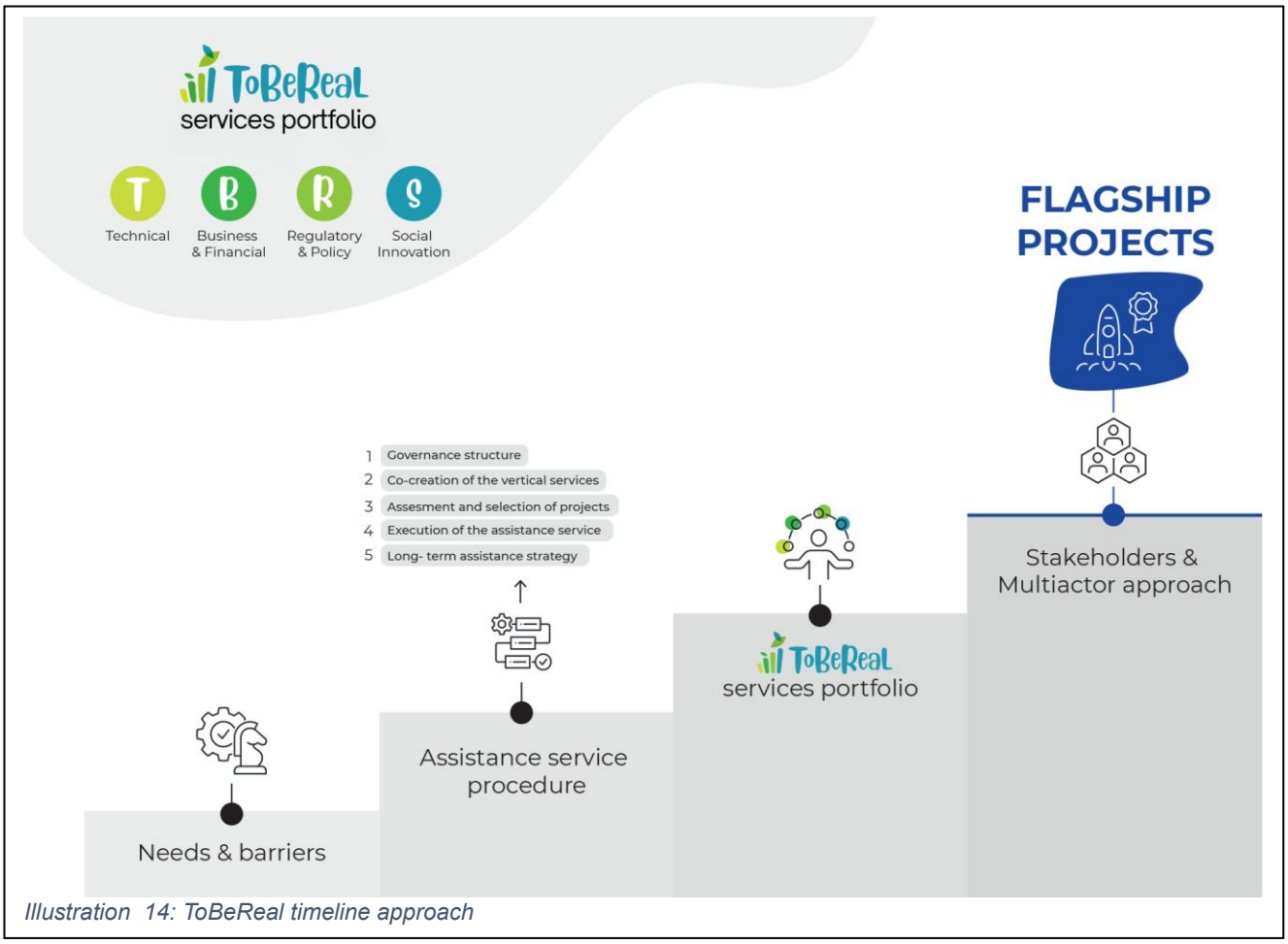

Illustration 14: ToBeReal timeline approach

Recognised as an EUSDR PA 8 Danube Lighthouse, ToBeReaL drives circular transitions, job creation, and innovation visibility, making it a strategic model for replicable bioeconomy development. It already has an approach that focuses on geographically spreading best practices, nevertheless, spreading its approach beyond the current project framework looks promising.

5.1.9 BIOECONOMY CLUSTER SERBIA

Foundation and Funding

The BIOECONOMY Cluster Serbia was established in June 2022 as the successor to the AGROINDUSTRY Cluster, originally founded in 2010 to unite agricultural producers and processors in

the Bačka region. AGROINDUSTRIJA's goal was to encourage, improve, and develop agricultural production and the food industry in Serbia, with a particular focus on Vojvodina. Starting with seven renowned producers and processors, the cluster steadily expanded to more than 50 members and three supporting institutions, becoming a hub for cooperation, joint projects, and innovation in the regional agro-food sector.

A turning point came through participation in two European transnational projects: BIOECO RDI (2018–2020, ADRION Programme) and GoDanBio (2020–2022, Danube Transnational Programme). These projects exposed members to new knowledge, best practices, and the concept of circular bioeconomy as developed in EU member states. The experience highlighted Serbia's need to move beyond traditional approaches to resource use and embrace sustainable, circular, and bio-based business models. It also confirmed the advantages of cluster-based cooperation, where geographically close enterprises and institutions linked by products, processes, technologies, and markets can act as engines of growth and innovation.

Illustration 15: Kick-off Meeting of DECIDE, major Bioeconomy Cluster Serbia project affiliation

Even though the Cluster has established itself with the named project participations in the last few years, it is fighting barriers like a still lacking active participation of entrepreneurs, varying well-explained services from the R&D side, a lack of green public procurement and a lack of reliable regulation basics. Especially targeting the first of these issues is a clear connection to support for the competitiveness of enterprises, which is why Bioeconomy Cluster Serbia was chosen as an EUSDR PA 8 Lighthouse.

The transformation into the BIOECONOMY Cluster was driven by local and regional stakeholders, with the Regional Agency for the Development of Small and Medium-Sized Enterprises Alma Mons Ltd.,

Novi Sad playing a key role. The agency's involvement in BIOECO RDI provided direct exposure to bioeconomy opportunities and a clearer picture of Serbia's position compared to other European countries. Establishing a dedicated bioeconomy cluster became essential to unite stakeholders, facilitate mutual assistance, and ensure joint representation before institutions. The subsequent GoDanBio project confirmed this direction and strengthened the initiators' motivation, drawing on their prior cluster experience.

Today, the BIOECONOMY Cluster continues the legacy of AGROINDUSTRIJA while shifting its focus from agricultural and food production to a broader circular bioeconomy perspective. It is conceived as a strategic instrument for enhancing competitiveness, fostering innovation, and positioning Vojvodina and Serbia more strongly within the European bioeconomy.

Main Activities

The cluster brings together agricultural producers, processors, SMEs, and support institutions. Its activities focus on strengthening cooperation among members, supporting innovation in agriculture and food production, and advancing the transition to a circular bioeconomy. It provides a platform for networking, joint project development, knowledge exchange, and representation at public institutions.

Illustration 16: Tastes of Tradition Fair in Subotica

Already during the period of the AGROINDUSTRIJA Cluster, members promoted local products and producers through traditional fairs and exhibitions, such as the Subotica fair. The photos above, showing typical Serbian food products presented at the event, illustrate the cluster's strong regional roots and its commitment to connecting traditional agricultural practices with modern bioeconomy principles.

Moreover, active engagement in European cooperation remains a priority, building on the experience of BIOECO RDI and GoDanBio, which introduced members to circular economy concepts and sustainable transformation pathways.

Results

On the basis of AGROINDUSTRIJA's foundation – growing from seven initial members to more than 50 companies and three support institutions – the BIOECONOMY Cluster has repositioned itself in line with European bioeconomy trends. Transnational projects provided valuable exposure to EU models, encouraged the adoption of circular practices, and built the capacity of members to develop bio-based solutions. The transformation has consolidated existing networks while also attracting new actors, creating a stronger and more diverse base for innovation and collaboration.

Impact

The cluster now serves as a strategic instrument for enhancing competitiveness and innovation in the regional agrifood sector while opening pathways into wider bio-based industries. It contributes to awareness-raising and capacity building for bioeconomy in Serbia and positions Vojvodina as a frontrunner in the national context. By promoting circular and sustainable practices, the cluster supports the transition from traditional resource use to renewable, circular, and biodegradable solutions. Institutional support from the Regional Agency for the Development of SMEs Alma Mons Ltd., combined with collaboration with academia and civil society, ensures strong stakeholder integration and the ability to bridge different perspectives.

Barriers and Replication Tips

Despite its progress, the development of bioeconomy in Serbia faces several challenges. Compared to EU member states, the country remains at an early stage of transition towards circular and bio-based business models. Knowledge gaps, limited financing opportunities, and fragmented stakeholder engagement continue to be barriers. Building a critical mass for innovation in the bioeconomy will require ongoing awareness-raising, improved access to funding, and stronger involvement of enterprises beyond the agricultural and food sectors.

The BIOECONOMY Cluster illustrates how traditional sectoral clusters can successfully transform into bioeconomy clusters by leveraging existing networks, engaging in EU-funded projects, and adopting international best practices. Other regions within and beyond the Danube Region can follow this pathway by building on established cluster structures, gradually broadening their focus to include circular and bio-based activities, and using transnational cooperation as a tool for knowledge transfer. Key success factors include strong institutional support, early involvement of SMEs, and close collaboration with academia and civil society. Showcasing the application of those is the prime reason for the BIOECONOMY Cluster Serbia serving as an EUSDR PA 8 Lighthouse.

5.1.10 SLOVENIAN CENTER FOR CIRCULAR ECONOMY

Partnership

The Slovenian Centre for Circular Economy (SCCE) is coordinated by the Chamber of Commerce and Industry of Slovenia with a broad consortium of partners: the Chamber of Craft and Small Business of Slovenia, the Slovenian National Building and Civil Engineering Institute, Pomurje Technology Park, E-Institute – Institute for Comprehensive Development Solutions, CPU Reuse Center, CONSENSUS, and ARCTUR. The project, starting in 2025, is financed by the European Regional Development Fund and the Ministry of Economy, Tourism and Sport of Slovenia. Together, these partners represent industry, academia, research, and civil society, providing the basis for a systemic transformation of the Slovenian economy toward circular models.

Main Activities

The SCCE main objective is to promote sustainable development and efficient resource use by introducing circular business models, reducing waste, and fostering innovation in production and consumption. Activities include the creation of a holistic virtual platform with a wide range of services and tools for networking actors from research, business, and the civil sector. The SCCE also implements educational programs, training, and workshops while offering consulting for SMEs, local communities, public administration, and the wider public.

To ensure accessibility, virtual and physical entry points are being established across Slovenia, providing advice, mentoring, and training. The SCCE cooperates closely with policymakers and ministries to accelerate the green transformation at national and regional levels. The emphasis is not only on reducing the environmental footprint but also on stimulating sustainable economic growth and social inclusion.

SCCE SLOVENIAN CENTRE FOR CIRCULAR ECONOMY

Illustration 17: SCCE Logo

REPUBLIC OF SLOVENIA MINISTRY OF THE ECONOMY, TOURISM AND SPORT

I FEEL SLOVENIA

Co-funded by the European Union

Illustration 18: Additional Logos

Key performance indicators include the operation of twelve entry points across Slovenia, the launch of a virtual platform with a knowledge base and tools for industrial symbiosis and secondary raw material trading, a database of service providers and lab environments, and the delivery of over 100 trainings and events. In addition, the SCCE is tasked with preparing a comprehensive study on the state of circular economy in Slovenia and supporting the establishment of new value chains and collaborations.

Methodology

The starting point was a situational analysis showing that many Slovenian businesses – especially SMEs – still perceive the green transition as a cost rather than an opportunity. Limited investment in low-carbon technologies, financing barriers, lack of knowledge, and insufficient expertise in local administrations and communities have slowed uptake. Citizens support the transition but remain concerned about affordability and tangible benefits.

To respond to these challenges, the project is structured into six interconnected work packages. These cover project management and coordination; building supportive infrastructure and partnerships; providing knowledge, training, and advisory services; offering advanced mentoring and coaching for complex projects; facilitating networking and value chain development; and communication and promotion at national and international level. A particular focus is placed on Eastern Slovenia, the less developed part of the country, ensuring that regional disparities are addressed and that the benefits of the circular transition reach all areas. Together, these work packages create a comprehensive framework to strengthen circular transition across sectors and regions.

Results

The project runs from January 2025 to May 2029 and is currently in its initial phase. Despite this, the first achievements are already visible. The virtual platform has been launched, including a self-assessment tool and a trading place for secondary raw materials, and work has started on developing a database of service providers and educational content. The SCCE has organised several onsite and online trainings with more than 600 participants, and a network of entry points has been set up, offering SMEs local counselling and services. Furthermore, collaboration has been established with three ministries to jointly address barriers and opportunities for Slovenia's transition to a circular economy.

Illustration 19: SCCE Partnership map

Impact

The Slovenian Centre for Circular Economy contributes to the competitiveness and sustainability of Slovenia's economy, supporting the objectives of national strategic documents on the green transition. For the industry, it supports new sustainable business models, efficient resource use, recycling and reuse, and the development of low-emission technologies. In construction, it promotes recycling of

materials, energy-efficient buildings, and sustainable building practices. In agriculture, it strengthens sustainable farming with fewer chemicals, improved soil quality, and nutrient cycling. In transport, it contributes to emission reduction, electrification, shared mobility, and more efficient logistics.

At the local level, municipalities and public enterprises benefit from integrated approaches to resource and waste management, new local supply chains, reduced dependence on imports, and stronger resilience. For policymakers, the SCCE provides expertise and dialogue to design effective legislative frameworks and accelerate the green transition, contributing to competitiveness, energy independence, and improved quality of life. For consumers and the public, it raises awareness of sustainable products and services, encouraging circular consumption habits and promoting broader acceptance of green practices.

Barriers and Replication Potential

Circular economy development in Slovenia faces barriers such as limited financing, lack of knowledge and expertise among SMEs and local administrations, and public concerns about the affordability of sustainable solutions. The SCCE addresses these issues through awareness-raising, targeted training, advisory services, and closer engagement with policymakers.

The Slovenian model does have clear replication potential, which is why the project was identified and selected as an EUSDR PA 8 Lighthouse. By combining virtual and physical entry points, a comprehensive service platform, capacity building, and strong partnerships with policymakers, it provides a blueprint for how national or regional centres can accelerate the circular transition. Key lessons learned include the importance of strong institutional leadership, engagement of SMEs from the start, and integration of research, business, and civil society into a shared framework.

5.2 DIGITALIZATION, ARTIFICIAL INTELLIGENCE, METAVERSE & VIRTUAL WORLDS

5.2.1 CROATIAN ARTIFICIAL INTELLIGENCE ASSOCIATION (CROAI)

Project Overview

The Croatian Artificial Intelligence Association (CroAI) serves as a national ecosystem enabler that unites companies, startups, experts, and institutions to accelerate the responsible and human-centric adoption of artificial intelligence. Founded in 2019, the association acts as a bridge between policy, education, and business, positioning Croatia as a competitive AI hub in the Central and Eastern European region. Through public–private collaboration, skills development, and policy dialogue, CroAI ensures that the benefits of AI are distributed broadly across society, while promoting alignment with the principles of the forthcoming EU AI Act.

Objectives

The association's primary objectives are to promote responsible AI use, strengthen Croatia's AI ecosystem through cross-sector collaboration, and boost digital literacy among educators, SMEs, and citizens. It also plays a key role in shaping both national and European AI policy through evidence-based advocacy and structured stakeholder dialogue.

Illustration 20: CroAI

Key Activities & Methods

CroAI implements its mission through a diverse portfolio of initiatives that combine capacity-building and innovation. Its flagship programme, "AI se educiraj", has reached more than 3.000 educators, providing practical AI literacy and fostering confidence in digital technologies. The organisation also co-leads the AI4Health.cro European Digital Innovation Hub (EDIH), which drives AI-enabled transformation in healthcare. In parallel, CroAI organises thematic meetups, working groups, and conferences, acting as a connector between startups, investors, policymakers, and academia.

Innovative Aspects

The innovation of CroAI lies in its holistic, ecosystem-based approach that integrates policy, education, and industry beyond a single-use project perspective. The association develops toolkits and blueprints for AI literacy and adoption that can easily be replicated across the Danube Region. Its multi-stakeholder governance model and diversified funding structure ensure long-term sustainability, neutrality, and resilience against shifting policy or market priorities.

Results & Expected Impact

As a result of its coordinated efforts, CroAI has strengthened the country's alignment with European AI policy frameworks and improved regulatory readiness across multiple sectors. The association has raised awareness of AI and digital skills among educators and SMEs, contributing to a more inclusive and digitally competent society. Furthermore, CroAI has significantly enhanced Croatia's visibility as an emerging AI actor in the Danube and wider Central and Eastern European region.

Transferability & Scalability

CroAI represents a transferable and scalable model for building national or regional AI communities. Its operational model – combining community management, policy roundtables, and structured literacy programmes – can be replicated through partnerships with EDIHs, NGOs, ministries, or chambers of commerce. The modular design of its programmes allows easy adaptation to different socio-economic contexts.

Barriers & Lessons Learned

Despite strong achievements, the initiative faces challenges such as fragmented stakeholder incentives, varying digital maturity levels, and general scepticism toward AI due to fears of job displacement. CroAI has addressed these issues by prioritising trust-building, literacy, and tangible demonstration projects. The key lesson is that sustainable AI ecosystems grow from trust, dialogue, and visible success stories, supported by institutionalised cooperation rather than one-off events.

Sustainability Considerations and Conclusion

CroAI's operations are grounded in principles of sustainability, focusing on human-centric design, ethical AI, and long-term capacity building. The organisation promotes environmentally efficient digital practices and invests in education and governance frameworks that ensure lasting impact beyond individual initiatives.

CroAI became an EUSDR PA 8 Lighthouse because it takes up community building in a field that is dynamic but fragmented and often shaped by a lack of partnerships that really set new initiatives in motion. Such initiatives, at the same time considering a resourceful and ethical AI uptake, are needed throughout Europe in order to connect supply and demand, contact and contact. Examples of concrete offers of the initiative lately are EDIH co-lead, AI literacy programs and coordinating AI policy dialogue in Croatia. Moreover, supporting local talent with regard to shaping the future of AI plays an important role in the organisation's portfolio.

By prioritising trust-building, ethical AI, and long-term sustainability, CroAI addresses barriers like fragmented incentives and digital maturity gaps, ensuring that the benefits of AI reach a broad spectrum of society. The association's work in supporting local talent, developing replicable toolkits, and facilitating cross-sector partnerships exemplifies how institutionalised cooperation can drive inclusive, resilient, and future-ready AI adoption – making CroAI a lighthouse for the Danube Region.

5.2.2 OPTIMUM

Project Overview

The OPTIMUM – Optimisation of Manufacturing and Transportation Infrastructure Processes through AI – project aims to develop advanced, AI-driven monitoring and control frameworks for industrial production lines and pipeline transport infrastructure. The initiative integrates sensor data, predictive models, and digital simulations to enhance the operational efficiency and sustainability of complex industrial systems. By intelligently analysing large and diverse datasets, OPTIMUM seeks to reduce unplanned downtime, minimise energy consumption, and improve safety and overall production quality.

The project is implemented by a consortium led by Constantine the Philosopher University in Nitra, in collaboration with PROUNION a.s. and TTC s.r.o., and is supported under the Recovery and Resilience Plan of the Slovak Republic. The project timeframe is from 2024 until 2026. Operating at the intersection of artificial intelligence, industrial engineering, and data analytics, OPTIMUM embodies a modern approach to transforming traditional industries into data-driven ecosystems capable of self-diagnosis and optimisation.

Objectives

OPTIMUM's primary goal is to design and validate predictive maintenance and real-time optimisation models for manufacturing and transport systems, particularly those involving pipelines and continuous processes. It focuses on developing hybrid AI–statistical approaches that remain robust even when dealing with noisy, incomplete, or heterogeneous industrial data. A further objective is to verify these methods under laboratory conditions using live data streaming, ensuring the results can be reliably scaled and transferred to industrial environments without operational risk.

Key Activities & Methods

To achieve its objectives, the project applies a structured methodology based on the CRISP-DM framework (Cross-Industry Standard Process for Data Mining). This includes a step-by-step process of business understanding, data collection, preparation, modelling, evaluation, and validation through experimental setups.

Illustration 21: PROUNION Logo

In its early stages, OPTIMUM conducted systematic reviews and established high-quality structured datasets (Work Packages 1–2), which laid the foundation for model design and testing (Work Packages 3–4). These efforts enable the development of analytical models that combine artificial intelligence and statistical reasoning.

A critical component of the project is simulation-based verification (WP5), which tests model performance under realistic operational scenarios. For example, pipeline leak detection and response are simulated using synthetic and real data streams to test the system's resilience and adaptability. This approach allows the project team to refine algorithms before real-world deployment, reducing technological and safety risks.

Innovative Aspects

OPTIMUM's innovation lies in its hybrid AI approach that fuses multiple data sources and integrates predictive analytics with digital twin technology. This enables prescriptive decision-making – where the system not only predicts outcomes but also recommends optimal interventions. The project's modular architecture allows individual components such as anomaly detection, energy optimisation, or scheduling to function independently or as part of a larger decision-support framework. This flexibility makes the solution adaptable to different industrial sectors and scales of operation.

The use of digital twins – a virtual representation of the physical process – also enhances understanding and control of complex systems. By continuously comparing simulation outputs with real-time sensor data, operators can anticipate issues before they occur, reducing inefficiencies and maintenance costs.

Results & Expected Impact

The expected results of OPTIMUM include measurable improvements in operational efficiency, resource management, and environmental performance. Predictive maintenance models are projected to significantly reduce unplanned downtime and material waste, while energy optimisation algorithms will contribute to lower energy use and emissions.

Beyond its technical achievements, the project contributes to scientific advancement through open research and methodological innovation at lower technology readiness levels (TRL 1–3). This knowledge creation supports future applied research and cross-sectoral transfer. The project's findings are designed to be openly shared and adapted by researchers and practitioners, further amplifying its regional and international impact.

Transferability & Scalability

The OPTIMUM methodology and tools are highly transferable across different industrial and infrastructure domains. The same framework can be applied to sectors such as energy distribution, water management, or healthcare systems with only minor adjustments to data inputs and performance parameters. Furthermore, the system's readiness for cloud and edge computing deployment ensures scalability – from individual factories to large, distributed networks of assets.

This makes OPTIMUM not just a research initiative but a foundation for broader digital transformation strategies within Industry 4.0 and the upcoming Industry 5.0 paradigm.

Barriers & Lessons Learned

Despite its strong technical foundations, the project faces challenges related to data access and heterogeneity. Industrial environments often involve proprietary systems and fragmented data architectures, complicating data collection and integration. Another barrier is the generalisability of AI models when process conditions vary over time or between facilities.

To address these challenges, the consortium has implemented early data-sharing protocols among partners and relies on a combination of synthetic and real-world data for training and validation. This iterative, incremental validation process ensures higher reliability and transparency. A key lesson learned is that effective collaboration between data scientists and domain experts is essential for translating technical potential into operational success.

Sustainability Considerations

Sustainability is embedded at the core of OPTIMUM's objectives. The project aligns digital innovation with environmental efficiency by reducing waste, improving energy management, and extending the lifespan of industrial assets. Moreover, its human-centric design and commitment to long-term capacity building reflect the principles of responsible innovation. By prioritising interoperability, openness, and training, the project ensures that the developed tools and models remain accessible and maintainable beyond the project's lifetime.

Conclusion

The project's mission is to leverage AI, IoT, and machine learning to transform industrial automation and support the digitalisation of the economy. By integrating predictive analytics and automation, it seeks to enhance operational efficiency, reduce energy consumption, and improve safety in manufacturing and pipeline transport systems. All of these are closely aligned with the goal of increasing the competitiveness of enterprises in the Danube Region, which accounts for OPTIMUM being chosen as an EUSDR PA 8 Lighthouse.

5.2.3 DIH AGRIFOOD DEMONSTRATION FARMS (DEMO FARMS)

Project Overview

The DIH AGRIFOOD Demonstration Farms (DEMO FARMS) initiative represents a user-centred and place-based innovation ecosystem that connects farmers, advisors, digital solution providers, and policymakers to co-design, test, and validate cutting-edge digital agriculture technologies directly in real farming environments. Rather than focusing solely on research or technology development, DEMO FARMS operates at the interface of innovation and practice, turning farms into living laboratories for AI, digital twins, robotics, and interoperable data systems.

Running since 2023, the initiative is led by ITC – Innovation Technology Cluster Murska Sobota and the Institute of Agriculture and Forestry Murska Sobota in Slovenia, supported by a broad network of farmers, scientists, and agritech companies. It plays a crucial role in accelerating the digital transformation of agriculture, demonstrating how technology can address pressing challenges such as productivity, sustainability, and climate resilience. Through its activities, DEMO FARMS also contributes to evidence-based policymaking, helping authorities design support schemes aligned with farmers' actual needs and technological readiness levels.

AGRIFOOD DIGITAL INNOVATION HUB

Illustration 22: DIH Agrifood Logo

Objectives

The primary goal of DEMO FARMS is to foster the implementation of advanced technologies and digital tools in real-life agricultural settings. The project aims to create a seamless connection between digital innovation and day-to-day farm operations, ensuring that new solutions are practical, cost-effective, and user-friendly. A key focus lies on data sharing via the DIH AGRIFOOD Data Space, developed in line with FAIR principles (Findable, Accessible, Interoperable, and Reusable).

Beyond technology deployment, DEMO FARMS prioritises capacity building and knowledge transfer. It empowers farmers through training, demonstrations, and advisory services, while also supporting financing schemes that make digital adoption viable for small and medium-sized agricultural enterprises.

Key Activities & Methods

The project's activities are structured around five core pillars: (1) technological deployment, (2) digital platforms, (3) data-space integration, (4) skills and awareness building, and (5) financing support. These pillars collectively create a robust framework for advancing agricultural digitalisation at multiple levels – from individual farm operations to regional innovation ecosystems.

Experiments are conducted across more than ten demonstration farms (over 20 individual sites), allowing for replication, cross-comparison, and validation of results under different conditions. The project uses a range of advanced digital tools, including Digital FieldBook, MyFarm, Benchmark, and Farm Manager, as well as systems for digital traceability and sustainability assessment.

A distinguishing feature of DEMO FARMS is its living-lab methodology, combining exploration, experimentation, and evaluation in a participatory setting. Farmers, researchers, and technology providers collaborate to co-create, test, and refine innovations, ensuring that outputs are grounded in practical experience rather than theoretical assumptions.

Innovative Aspects

Innovation within DEMO FARMS lies in its integration of technology, community engagement, and policy learning. It is one of the few initiatives in the region that fully incorporates real-life pilots into both policy development and funding mechanisms, effectively linking bottom-up innovation with top-down governance.

The living-lab approach goes beyond standard demonstration projects by enabling continuous feedback loops between technology developers and end-users. This ensures not only higher adoption rates but also more resilient and context-sensitive solutions. The use of interoperable data spaces and digital twins enables farmers to manage operations more efficiently and make informed decisions based on real-time insights.

Results & Expected Impact

DEMO FARMS has already delivered tangible results by accelerating technology uptake among farmers and improving data interoperability across agricultural systems. Participating farms have demonstrated measurable gains in efficiency, reduced resource use, and better compliance with sustainability standards.

At the regional level, the project contributes to building digital competencies among advisors and agricultural institutions, establishing the foundation for a broader "true food system transformation" that spans technology, business models, and societal behaviour. Its participatory design also helps rebuild

trust between farmers and policymakers, showing that digitalisation can serve both productivity and sustainability goals.

Transferability & Scalability

The DEMO FARMS model provides a replicable blueprint for digital agriculture transformation across the Danube Region and beyond. Its structure – built around trusted agricultural advisors as intermediaries – ensures that knowledge flows effectively between technology providers and end-users.

The initiative can be scaled and replicated through Digital Innovation Hubs (DIHs), European Digital Innovation Hubs (EDIHs), and regional advisory networks, leveraging existing infrastructures to reach more farmers and rural stakeholders. The flexible design allows adaptation to different crops, climates, and regulatory frameworks, making it suitable for both high-tech and traditional agricultural contexts.

Illustration 23: DIH Agrifood on-site events

Barriers & Lessons Learned

Despite its success, the project faces several barriers, including a persistent technology adoption gap among smallholders, complex policy frameworks, fragmented funding channels, and limited trust in digital systems. Legacy business models and insufficient interoperability between existing solutions also slow down adoption.

A key lesson learned is the importance of working through “historically trusted” agricultural advisors, who act as bridges between farmers and innovation ecosystems. By co-creating solutions with end-users and aligning incentives across different programmes and policy instruments, DEMO FARMS has proven that trust and collaboration are central to digital transformation in agriculture.

Sustainability Considerations

Sustainability is embedded in the core of DEMO FARMS' mission. The project not only promotes environmental efficiency through precision farming and data-driven decision-making but also fosters social and economic sustainability by strengthening local capacities and long-term knowledge networks.

Training and governance mechanisms are integrated into all activities to ensure the continuity of results beyond the project's lifetime. Interoperability, open standards, and cross-border cooperation guarantee that DEMO FARMS remains a cornerstone for sustainable agricultural digitalisation in the Danube Region.

Conclusion

Its wholesome approach makes DIH Agrifood Demonstration Farms a sort of one-stop shop application of a broad project idea that provides farmers with all the necessary support to tackle the transformation of their own businesses – which is in the interest of competitiveness of enterprises in the Danube Region and the reason for it becoming an EUSDR PA 8 Lighthouse.

5.2.4 INNOVATIVE VR AND SIMULATED MODEL CASES FOR POLICE TRAINING

Project Overview

The Innovative System of Virtual Reality and Simulated Model Cases of Security Character is a pioneering initiative (2023-2025) aimed at transforming police education and training through immersive technologies. The project develops a structured VR-based training and testing system designed specifically for law enforcement officers who operate in high-risk and psychologically demanding environments. By replicating real-life conditions through detailed virtual scenarios, the system allows officers to safely practice decision-making, situational awareness, and communication skills in a controlled yet realistic setting. XR Institute s.r.o. in Czech Republic coordinates the project.

The system comprises four major VR applications simulating key operational contexts: crime-scene investigation (murder and burglary cases), active shooter intervention in a hospital, and airport profiling of high-risk individuals. Each scenario is built with a high degree of realism and interactivity to reflect authentic challenges faced by officers in the field.

Objectives

The project's overarching goal is to enhance the effectiveness of police interventions and improve procedural adherence in critical and unpredictable situations. By leveraging immersive technologies, the training platform aims to foster correct behavioural responses, improve decision accuracy, and strengthen resilience under stress. The objectives include enabling the testing and evaluation of trainees' mastery in complex scenarios using measurable performance indicators, ensuring that training outcomes are evidence-based and replicable.

Key Activities & Methods

The project follows a phased and user-centred development approach encompassing analytical and legal research, software development, and target-group testing. The analytical phase ensures compliance with data protection and ethical standards relevant to security services, while the development phase focuses on integrating advanced features such as voice interaction, biofeedback monitoring (heart rate, stress levels), and hand tracking.

A particularly innovative aspect of the system is its adaptive scenario difficulty, which adjusts in real time according to the trainee's physiological signals. This closed-loop feedback mechanism allows the VR environment to dynamically modulate the complexity and stress intensity of scenarios, tailoring the training to each participant's capacity and progress. The platform includes both training and testing modes, enabling structured progression from learning basic procedures to mastering complex, multi-agent situations.

Innovative aspects

The combination of biofeedback technology and immersive virtual reality distinguishes this project from conventional simulation-based training. By linking physiological responses to the training environment, the system creates a realistic and psychologically accurate simulation of stress and decision-making under pressure.

The project also introduces natural interaction methods, such as voice commands and gesture-based controls through hand tracking, to enhance realism and the transferability of skills from the virtual to the real world. These features enable officers to react intuitively, reinforcing the development of motor and cognitive reflexes essential for effective field performance.

Illustration 24: VR-Illustration

Results & Expected Impact

The expected results of the project include a significant improvement in police preparedness for rare but high-risk situations, such as terrorist attacks or critical incidents in public spaces. High-fidelity simulations substantially reduce the logistical and financial burden associated with traditional training, while offering a safe environment for repeated practice.

Early evaluations have shown strong positive feedback from participants, who reported increased confidence and competence in decision-making under stress. Moreover, the project's scientific contribution has been validated through peer-reviewed publications, including recognition at international conferences such as AHFE 2024, where it received a Best Paper Award. These outputs highlight both the academic and practical value of the initiative.

Transferability & Scalability

The VR platform developed within this project is designed to be highly adaptable and portable. The modular architecture allows the transfer of training logic and simulation modules to other contexts, such as schools, public administration offices, or emergency response training centres. The underlying software supports the integration of additional scenarios, including multi-agent environments, where multiple participants interact in real time.

The concept is also extendable beyond police training to other sectors where situational awareness, stress management, and procedural precision are critical – for example, healthcare emergency units, transport security, or firefighting. This scalability enhances the project's long-term potential and ensures its broader contribution to public safety and resilience.

Barriers & Lessons Learned

The project faced technical and operational challenges, particularly regarding the integration of biofeedback systems and hardware calibration. Combining accurate physiological measurements with immersive visual and auditory feedback required iterative fine-tuning and interdisciplinary cooperation between software engineers, psychologists, and law enforcement experts.

One of the key lessons learned was the necessity of co-design with end-users – involving police officers from the earliest stages of development ensured that scenarios remained realistic, relevant, and compliant with actual procedures. Rigorous testing and iterative optimisation not only improved usability but also maximised the pedagogical value of the training platform.

Sustainability Considerations

The project pursues sustainability by aligning digital innovation with environmental efficiency, human-centric design, and long-term capacity building. Where relevant, it reduces energy and material use, embeds training and governance mechanisms, and prioritises interoperability and openness for future maintenance.

Conclusion

VR training is a low-cost change that is beneficial to training schedules and most easily replicable and scalable (for example in terms of the complexity of the situation at hand) at the same time. For the latter reason, the project can rightfully be called an EUSDR PA 8 Lighthouse. The modular configuration of the project is one of its main strengths: The logic of the scenarios can be modified in a way that more complex situations can be simulated. Therefore, the wide range of application options is obvious.

5.2.5 INDUSTRY 5.0: OPERATOR 4.0 (RESILIENT HUMAN–MACHINE COLLABORATION)

Project Overview

The Operator Department of the Scientific Association for Mechanical Engineering in Hungary represents a cornerstone in the evolution of smart, resilient, and socially sustainable factories. Currently running from 2024 to 2026, its guiding vision is to redefine industrial operations by creating human-centric environments where people and technologies co-create value. Instead of positioning automation as a substitute for human work, the project frames operators, technicians, supervisors, and managers as skilled decision-makers within cyber-physical production systems. In doing so, it challenges the traditional notion of Industry 4.0 as merely a technology-driven paradigm, instead advancing towards Industry 5.0, which emphasises synergy between human intelligence and artificial intelligence.

The department develops and validates adaptive workplace systems designed to enhance physical, cognitive, and emotional well-being. This involves the integration of assistive technologies – including exoskeletons, augmented and virtual reality (AR/VR) interfaces, and smart wearables – into daily production routines. The project thus aims to strike a balance between digital efficiency and human resilience, ensuring that innovation strengthens both competitiveness and the social fabric of work.

Objectives

The project pursues three core objectives that collectively define its human-centred ethos. First, it seeks to enable the “Resilient Operator 5.0” through adaptive work environments and intelligent support tools that respond dynamically to operator needs and conditions. Second, it aims to reduce physical and cognitive load, supporting occupational safety and health (OSH) in alignment with European directives. Finally, it aspires to foster a human–automation symbiosis – one that enhances productivity and creativity without diminishing human agency or judgment.

Together, these objectives reflect a paradigm shift: from human adaptation to technology, toward technology adaptation to humans.

Key Activities & Methods

The Operator Department applies a layered inquiry approach, combining quantitative industrial data with qualitative insights into worker experience and organisational culture. This dual perspective allows the team to assess digital and organisational maturity across industrial partners while simultaneously testing assistive technologies in real production contexts.

Core activities include:

- The design and testing of adaptive workplaces, integrating exoskeletons for ergonomic support, AR/VR for guided assembly or remote collaboration, and smart wearables for health and fatigue monitoring.
- Mixed-method assessments involving workplace observations, interviews, and digital readiness audits.
- Development of training modules that enable smooth integration of human-centric technologies and reinforce operator trust in digital systems.

These methods bridge the gap between human factors research and technological engineering, ensuring that innovations are not imposed but co-created with the workforce.

Innovative Aspects

The project’s most distinctive innovation lies in its human-driven design philosophy. While many industrial transformations focus on automation or digital tools, the Operator Department emphasises trust, culture, and the redefinition of roles as central to technological success. In this model, operators are not passive users but co-authors of digital transformation.

The project also introduces the concept of systemic ergonomics, where physical and psychological resilience are treated as integral components of performance rather than external constraints. In practice, this means integrating resilience metrics – such as recovery time, adaptability, and perceived control – into the same dashboards that monitor production efficiency. This systemic approach transforms ergonomics from a safety compliance issue into a strategic enabler of Industry 5.0 performance.

Results & Expected Impact

Preliminary results demonstrate promising outcomes in both technical and social dimensions. On the operational side, the integration of assistive technologies has increased productivity and innovation capacity, while on the human side, it has reduced the fear of technological displacement by positioning workers as active participants in innovation. Early pilot studies within established industrial firms reveal

a growing openness to human-centric transformation, though they also highlight persistent gaps in the adoption of cognitive support tools and data-driven ergonomics.

In the medium term, the project is expected to contribute to the creation of inclusive, ethical, and future-ready industrial ecosystems, where well-being, adaptability, and collaboration define competitive advantage.

Transferability & Scalability

The methodologies and technologies developed within this project are highly transferable across manufacturing contexts. Because the approach prioritises culture, co-creation, and modular support technologies, it can be adapted to both high-tech environments and traditional production facilities. Its strength lies in replicability through principles rather than prescriptions – allowing each organisation to tailor solutions to its specific human and operational realities.

This human-first perspective makes the Operator Department's model more durable and scalable than purely technology-led rollouts, which often fail due to resistance or misalignment with workplace culture.

Illustration 25: Operator 4.0 Visualisation

Barriers & Lessons Learned

Despite its success, the project faces notable challenges. Cultural inertia – manifested in scepticism toward new tools and resistance to behavioural change – remains the most significant barrier. Additionally, unclear communication of benefits can limit enthusiasm for adoption among operators and middle management.

The project's central lesson is that transformation must begin with trust-building. Technology should not be introduced as a replacement but as an ally, and this requires deliberate co-design with employees. Treating people as co-authors of their future workplace not only improves acceptance but also leads to better, more context-sensitive innovations.

Sustainability Considerations

The Operator Department integrates sustainability on multiple levels: environmental, social, and institutional. Environmentally, the implementation of ergonomic tools and adaptive systems reduces waste and energy use by minimising human error and unplanned downtime. Socially, it enhances long-term workforce well-being, safety, and inclusion, ensuring that digital transformation remains human-centred and equitable.

From an institutional perspective, the project embeds governance and training mechanisms that enable continuous learning and improvement. Openness, interoperability, and shared standards ensure that these solutions remain maintainable and extendable beyond individual project cycles. In essence, the Operator Department exemplifies how digital innovation and human sustainability can co-evolve, driving a new paradigm of resilient and ethical industrial growth.

Conclusion

The generated and further possible impact of the Operator project is obvious: The division analyses industrial activities comprehensively to develop optimal solutions through human-technology interaction for improved operational performance. It evaluates safety and ergonomics to reduce physical and mental strain and ensure compliance with occupational regulations. These results, in the end result, also have the potential to make employers more attractive to skilled workers seeking modern industry jobs – and therefore are in the interest of the competitiveness of enterprises, which is why the project has been chosen as an EUSDR PA 8 Lighthouse.

5.2.6 CIRCULAR DIGIBUILD

Project Overview

Circular DigiBuild accelerates the construction sector's transition toward circularity through the strategic integration of digital technologies and data-driven methodologies. The project responds to one of the most pressing challenges in Europe's built environment: Excessive resource consumption and waste generation throughout the construction lifecycle. It demonstrates how digitalisation – when combined with circular economy principles – can transform the sector into a more efficient, transparent, and regenerative system. Circular DigiBuild is an Interreg Danube Region Programme project running 2024-2026 and is coordinated by the Business Agency Association Bulgaria, with Danube Region project partners in Austria, Croatia, Hungary, Slovak Republic, Slovenia, Romania, Bosnia and Herzegovina, Moldova, Montenegro and Serbia.

By linking urban mining, material passports, building logbooks, and smart operation models, Circular DigiBuild establishes a holistic ecosystem for sustainable construction. The initiative builds a Danubian cluster for circular construction and digitalisation, promoting knowledge exchange and cooperation across borders. The emphasis is not merely on developing new tools but on creating interoperable frameworks and shared standards that make circularity measurable, comparable, and replicable.

Objectives

Circular DigiBuild pursues a set of interrelated objectives aimed at systemic transformation of the construction value chain. Its first goal is to establish a Danubian network and cluster that unites digitalisation and circular construction stakeholders – from policy makers and academia to industry and local authorities. This network acts as both a knowledge-sharing platform and an accelerator for cross-border collaboration.

Second, the project aims to pilot open, interoperable tools such as the Urban Mining Screener (UMS) and smart building sensor minimisation systems. These pilots generate data, models, and prototypes that demonstrate the feasibility and scalability of circular and data-based practices in real environments.

Finally, the project seeks to produce transnational strategies, action plans, and policy recommendations, ensuring that the results extend beyond individual pilots and contribute to long-term governance reforms at both regional and European levels.

Key Activities & Methods

Circular DigiBuild operationalises its objectives through three major components: technological pilots, stakeholder engagement, and policy integration.

The Urban Mining Screener (UMS) represents one of the project's flagship tools. It predicts the material composition and potential reuse value of buildings using minimal input parameters, supporting both reuse planning and CO_2 impact tracking. This digital innovation allows cities and investors to plan deconstruction, refurbishment, and renovation projects more strategically – maximising material recovery and reducing waste.

The Smart Building Sensor Minimisation pilot applies machine learning and grey-box models to reduce the number of physical sensors required in building operations while preserving comfort, efficiency, and accuracy. This reduces hardware costs and energy use, demonstrating how smart systems can be both technologically advanced and environmentally responsible.

Beyond the technological layer, Circular DigiBuild fosters active cooperation through quadruple-helix working groups, organised into four pillars: Collaboration, Knowledge, Piloting, and Change. These structures ensure that public authorities, businesses, research institutions, and citizens participate jointly in co-designing, testing, and policy feedback loops.

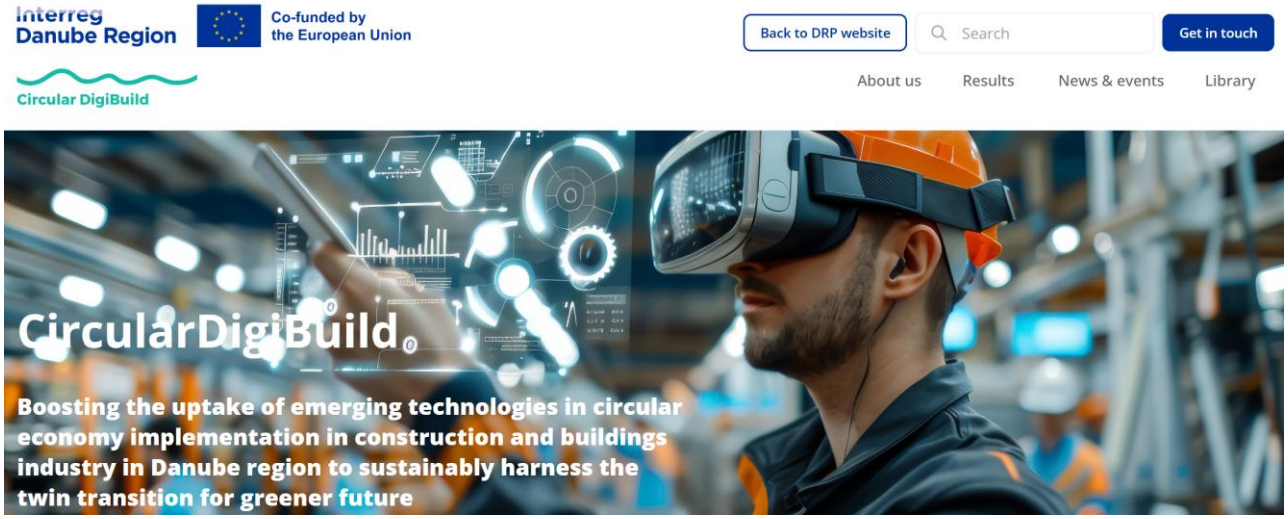

Illustration 26: Circular DigiBuild Website

Innovative Aspects

Circular DigiBuild's novelty lies in its end-to-end approach to circularity. It simultaneously addresses embodied materials (upstream) and building operations (downstream), thus covering the full lifecycle of the built environment. This integration ensures that decisions made during design and construction are informed by data from use, maintenance, and demolition stages – closing the circular loop.

Another key innovation is the introduction of open identifiers and blockchain-based solutions for material traceability and verification. Through material passports and building logbooks, the project creates

reliable digital records that document material origins, quantities, and reuse potential. This transparency is essential for fostering trust among stakeholders and enabling new circular business models.

The use of interoperable, open-source standards further enhances the project's value, ensuring that outcomes can be integrated into other digital ecosystems and replicated across the Danube Region and beyond.

Results & Expected Impact

Circular DigiBuild is already demonstrating tangible results in both technological performance and institutional collaboration. Its pilots generate validated data for CO_2 reduction, material reuse, and smart operation efficiency, while the cross-border working groups have improved policy alignment among participating countries.

The project's transnational upscaling plan lays the foundation for a Circular Construction Cluster, designed to sustain and expand these activities after the project's formal end. Expected long-term impacts include increased institutional capacity, greater transparency in construction value chains, and accelerated adoption of circular building standards across the Danube Region.

Transferability & Scalability

A defining strength of Circular DigiBuild lies in its replicability. The project's tools – such as UMS and the smart operation models – are open-source and standards-based, enabling adaptation in various national and local contexts. The use of reusable identifiers and open data structures simplifies cross-border information exchange, a key condition for the European circular construction market.

Additionally, the project's learning structures – Regional Multi-Stakeholder Groups (RMSGs), thematic workshops, and digital hubs – create a permanent mechanism for knowledge transfer and policy dialogue. These structures significantly lower policy and market barriers, facilitating the spread of best practices beyond pilot regions.

Barriers & Lessons Learned

Circular DigiBuild also encountered structural challenges inherent to the construction sector. The fragmentation of the value chain, low digital maturity, and varying national regulatory frameworks posed significant obstacles to uniform implementation. Moreover, achieving true interoperability between data systems remains technically demanding.

However, the project's experience underscores several critical lessons: the importance of adopting open standards to ensure compatibility; the value of inclusive stakeholder engagement from early stages; and the efficiency of leveraging existing DIH and EDIH infrastructures to build digital capacity without duplication of effort. These insights provide a roadmap for future initiatives aiming to combine digitalisation and circularity in similarly complex ecosystems.

Sustainability Considerations

Circular DigiBuild is a model example of sustainability by design. By promoting material reuse, waste reduction, and energy efficiency, it directly contributes to the EU's Green Deal and Renovation Wave objectives. The project not only delivers short-term technical outputs but also establishes long-term governance and training mechanisms to maintain progress.

Human-centric design is embedded in all activities, ensuring that technological change supports local communities, workers, and SMEs. The emphasis on interoperability and openness guarantees that

project outcomes remain accessible, adaptable, and future-proof. This way, Circular DigiBuild creates both the digital and institutional foundations for an inclusive, sustainable, and data-driven construction sector across the Danube Region.

Conclusion

Incorporating a quadruple-helix approach to include all relevant stakeholders, Circular DigiBuild is a PA 8 Lighthouse because it helps the competitiveness of enterprises by its closeness to the reality of the construction sector while at the same time, by means of two different pilot systems, fostering active technology uptake and forward-thinking in a way that not only considers, but applies circular economy strategies. Adding another layer, the project is identifying policy barriers and developing recommendations in order to make policy frameworks more useful for the changes in the construction sector that lay ahead.

5.2.7 VIRADIA – VIRTUAL DIAGNOSTIC TOOL FOR NEUROLOGICAL EXAMINATIONS

VIRADIA represents a transformative step in digital healthcare by merging virtual reality (VR) and artificial intelligence (AI) to create accessible, home-based diagnostic tools for neurological disorders. The project's vision is to make standardised neurological testing available outside clinical environments while maintaining medical-grade accuracy and scientific rigour. The project is led by GAMETHERAPY s.r.o. in Slovakia and is running from 2025 until 2026.

Traditional neurological assessments – such as the 9-Hole Peg Test, Timed Up and Go (TUG), Symbol Digit Modalities Test (SDMT), and Montreal Cognitive Assessment (MoCA) – require in-person administration by trained specialists. VIRADIA reimagines these validated instruments as immersive VR experiences that capture fine-grained motion and cognitive performance data. Using AI-powered analysis, the system identifies early signs of motor and cognitive decline long before they manifest as clinically visible symptoms.

By combining medical reliability, digital accessibility, and user-friendly design, VIRADIA aims to democratise neurological diagnostics, reduce the burden on healthcare systems, and empower individuals to monitor their cognitive health proactively.

Objectives

The project pursues a clear, clinically driven objective framework.

First, it aims to enable accurate, remote diagnostics through immersive, standardised VR environments, thereby improving accessibility – particularly for patients with limited mobility or those living in remote regions. Second, VIRADIA seeks to standardise and automate assessments to ensure repeatability, objectivity, and comparability across time and populations. Finally, it focuses on certification, regulatory compliance, and market preparation, laying the groundwork for a clinically validated, CE-marked digital health product suitable for integration into national healthcare systems.

Collectively, these objectives position VIRADIA as both a technological innovation and a regulatory model for the next generation of medical diagnostics.

Key Activities & Methods

VIRADIA's structured implementation is organised into three main work packages:

- WP1 – Clinical Standards Mapping and VR Prototyping: The team mapped established clinical assessment procedures to their digital equivalents, ensuring scientific consistency. A VR prototype was developed and tested with healthy users to assess usability, comfort, and calibration.
- WP2 – AI Model Development and Platform Integration: Based on the pilot data, AI algorithms were trained to detect deviations in movement patterns, reaction times, and task completion metrics. Continuous user feedback shaped the platform's ergonomic design and user interface, optimising accessibility and reducing learning time.
- WP3 – Clinical Validation and Market Preparation: The final stage includes formal validation with patient populations, preparation of regulatory documentation, and alignment with EU Medical Device Regulation (MDR) requirements. This also covers data privacy, cybersecurity, and ethical compliance under the GDPR framework.

Through this phased, evidence-based approach, VIRADIA ensures that every development milestone aligns with both medical integrity and user experience excellence.

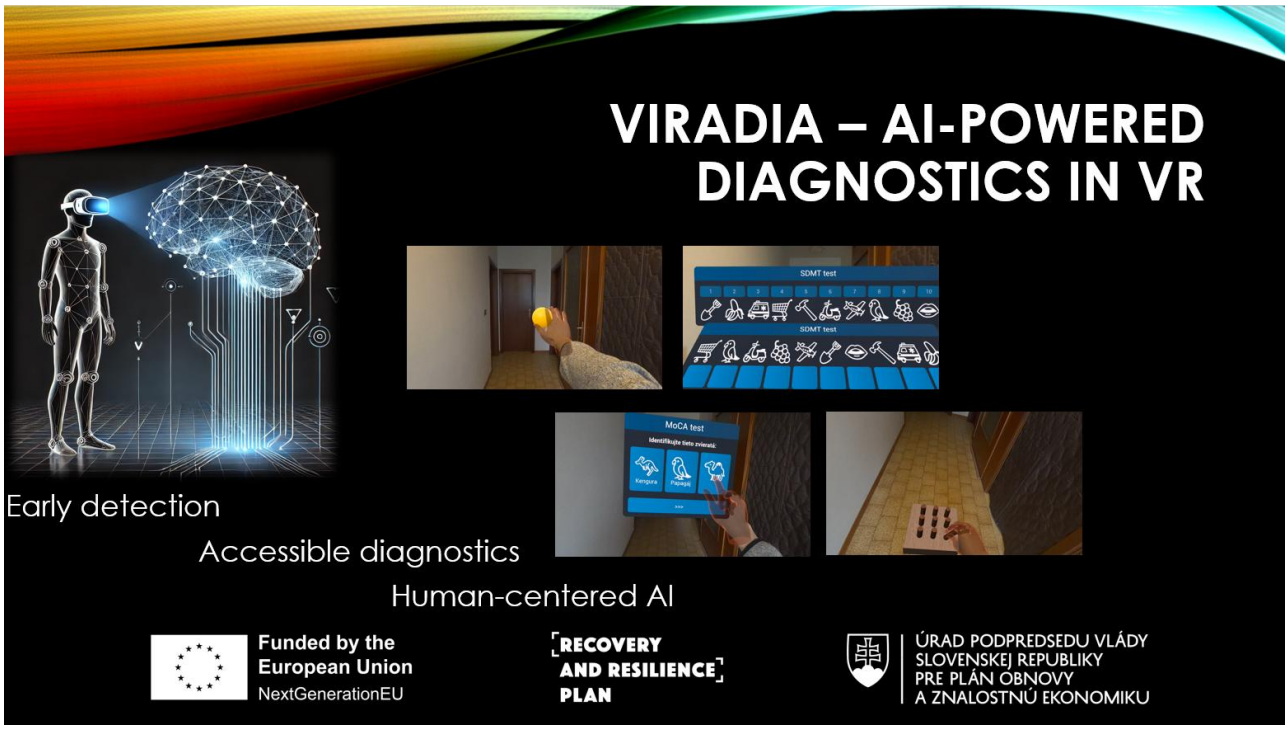

Illustration 27: VIRADIA Overview

Innovative Aspects

VIRADIA's innovation lies in its fusion of validated clinical science with immersive digital technology. It is the first known system to digitise multiple standardised neurology tests within a single VR platform enhanced by AI-based real-time analysis. This enables clinicians to collect consistent, high-resolution data on motor precision, reaction times, and cognitive processing, reducing observer bias and improving diagnostic accuracy.

A further innovation is the home-readiness of the system. Unlike complex laboratory setups, VIRADIA runs on commodity VR headsets, making it feasible for patients to complete tests in their own homes. Real-time data transmission enables remote monitoring, while embedded AI interprets results immediately and flags anomalies for clinician review.

In this way, VIRADIA bridges the gap between clinical-grade testing and digital health accessibility, setting a new benchmark for human–machine interaction in medical diagnostics.

Results & Expected Impact

VIRADIA's early outcomes demonstrate strong potential for both healthcare innovation and societal benefit. Pilot studies suggest that the tool can detect subtle neurological changes that may escape traditional clinical observation. This supports earlier interventions, improving treatment outcomes and quality of life.

By automating repetitive assessments, the project also reduces costs and workload for healthcare providers, freeing up specialist time for complex patient care. The standardised data outputs facilitate cross-border interoperability, supporting the EU's goal of creating a unified digital health space. In the long term, VIRADIA could become a foundation for personalised, preventive neurology, shifting the focus from reaction to prediction.

Transferability & Scalability

VIRADIA's architecture is inherently modular and scalable. Each diagnostic test functions as a self-contained module, allowing health institutions to adopt individual components or integrate the full suite depending on their needs. This modularity also simplifies localisation: Tests can be translated and culturally adapted for different languages and healthcare systems without compromising scientific validity.

The underlying approach is easily replicable across medical domains. Beyond neurology, the same principles could be applied to rehabilitation, mental health assessment, and paediatric motor development monitoring. Integration with electronic health record (EHR) systems further enhances scalability, enabling seamless data sharing within national and transnational healthcare infrastructures.

Barriers & Lessons Learned

As with any medtech innovation, VIRADIA faced multiple barriers. Ensuring medical accuracy and validation in a virtual environment proved challenging, requiring close collaboration between clinicians, engineers, and regulatory experts. Calibrating AI algorithms for sensitivity and generalisability across diverse patient populations demanded extensive iterative testing.

The project's most important lesson is the need for clinician engagement from the earliest stages. Continuous feedback loops between developers and medical practitioners are essential to ensure both usability and clinical trust. Additionally, adopting a test-driven, modular design allowed for faster iteration and easier adaptation to new clinical requirements or technologies.

Sustainability Considerations

VIRADIA embodies sustainability not only in environmental terms but also in its long-term healthcare value. By enabling remote diagnostics, it reduces patient travel, thereby cutting emissions and logistical costs. Its human-centric design makes advanced diagnostics accessible even to populations with limited healthcare access, aligning with EU goals of inclusivity and digital equality.

From an operational standpoint, the system's modularity and interoperability ensure its longevity: components can be updated without obsolescence, and open standards allow integration with future digital health platforms. Furthermore, the project emphasises training and governance mechanisms, ensuring that clinicians, developers, and regulators can jointly sustain and evolve the technology well beyond the project's initial phase.

In essence, VIRADIA demonstrates how responsible digital innovation can advance clinical excellence, equity, and sustainability – laying the groundwork for a new era of AI-augmented, patient-centred healthcare.

Conclusion

The project not only generates an impact in terms of technology uptake, transfer and future application, but also with reference to access to medical solutions for people far off city medical infrastructure and people with limited mobility. Nevertheless, the solution also clearly shows a path for possible future AI and VR industries and therefore a path for new value chains and markets, resulting in an opportunity for the increase of competitiveness of enterprises in the Danube Region. Therefore, VIRADIA was chosen as an EUSDR PA 8 Lighthouse.

5.2.8 CITADELS – CULTIVATING INDUSTRY 5.0 TALENTS

Project Overview

CITADELS (Cultivating Industry 5.0 Talents) is a forward-looking initiative dedicated to bridging the gap between advanced DeepTech research and industrial application across Europe's widening countries. Its mission is to build human-centric Industry 5.0 talent pipelines, creating the skills, structures, and opportunities necessary for inclusive and sustainable innovation. By linking research institutions, businesses, and innovation intermediaries, CITADELS strengthens regional competitiveness while reducing brain drain and promoting cross-border mobility of highly skilled professionals.

The project brings together a consortium led by the University of Belgrade and includes partners from Serbia, Slovenia, Hungary, the Czech Republic, Austria, and Bosnia & Herzegovina. The project is funded via Horizon Europe, starts in 2025 and runs until 2029.Through the alignment of DeepTech testbeds, talent development programmes, and responsible innovation frameworks, CITADELS enables a more cohesive European innovation ecosystem. It combines training, mobility, and technology transfer activities to ensure that scientific discoveries are translated into industrial impact while keeping human and ethical values at the core.

Objectives

The project pursues a threefold objective framework aligned with the Industry 5.0 vision.

First, it aims to define and deploy DeepTech testbeds that act as experimentation environments for advanced technologies, ranging from artificial intelligence and robotics to nanotechnology and biotechnology. These testbeds are connected with talent support mechanisms that allow young researchers and engineers to gain hands-on experience through secondments and Proof-of-Concept (PoC) actions. Second, CITADELS focuses on upskilling research and innovation (R&I) support talents and facilitating cross-border knowledge circulation. This approach addresses both the need for technological excellence and the structural inequalities that have historically limited innovation in widening countries. Finally, the project promotes responsible research and innovation (RRI) principles,

ensuring that technological progress under Industry 5.0 remains aligned with societal needs, ethical considerations, and sustainability objectives.

Key Activities & Methods

CITADELS is structured into multiple work packages that together create a comprehensive talent and innovation ecosystem.

- WP2 focuses on the definition of DeepTech testbeds, mapping existing infrastructures, identifying capability gaps, and establishing criteria for selection and operation.
- WP3 and WP4 manage secondments, training activities, and knowledge exchanges, connecting academic researchers with industrial partners through both short- and long-term placements.
- WP5 delivers a career support system, offering personalised mentorship, career guidance, and reintegration support for participants returning from secondments.
- WP6 ensures effective dissemination, communication, and exploitation, maximising the visibility and reusability of project outcomes.

The project follows a three-phase implementation model:

1. Definition and alignment phase, where testbeds and talent needs are mapped.
2. Implementation phase, which focuses on cross-sector exchanges and Proof-of-Concept demonstrations.
3. Post-secondment phase, aimed at evaluating impact, supporting career progression, and institutionalising successful practices.

Innovative Aspects

CITADELS introduces a dual-track innovation model that balances academic exploration and industrial application. The academic track (TRL 3–5) supports early-stage Proof-of-Concept research, while the industrial track (TRL 6–8) promotes deployment and commercialisation of validated solutions. This alignment of technology readiness levels ensures that research results transition smoothly into market-ready innovations.

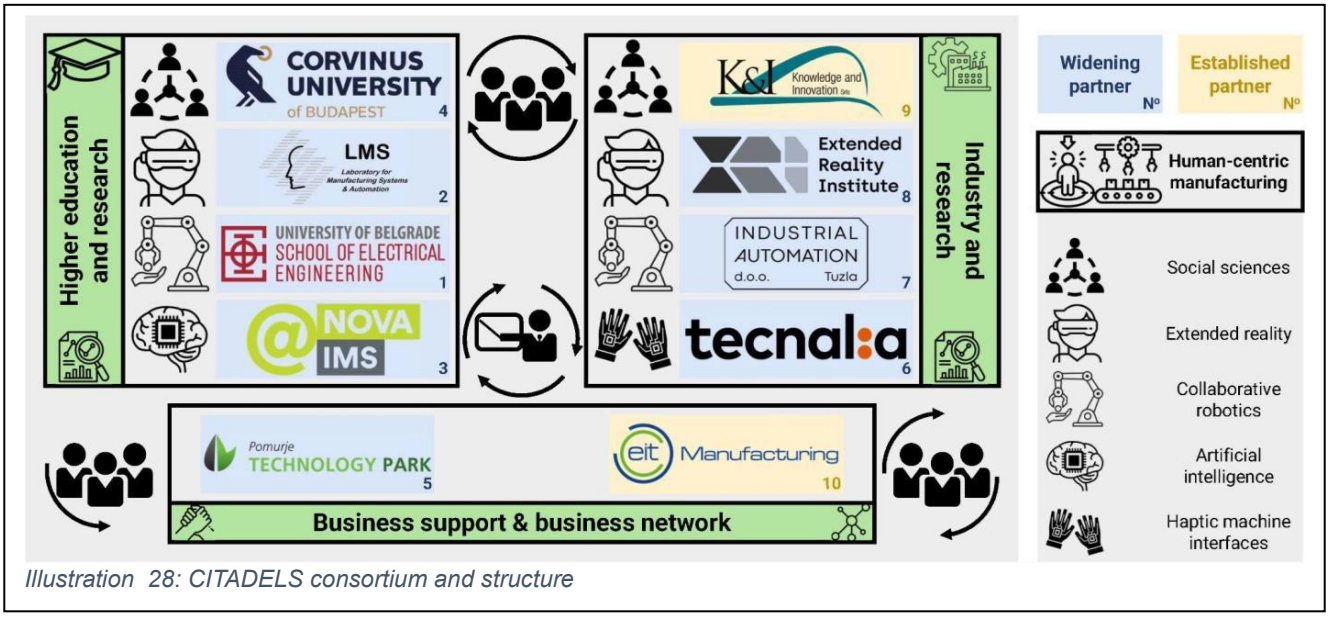

Illustration 28: CITADELS consortium and structure

Another key innovation lies in the integration of social sciences and humanities (SSH) into the DeepTech domain. This interdisciplinary approach brings ethical reflection, user understanding, and social impact assessment into traditionally technology-driven research areas. By embedding human-centred design and ethical foresight, CITADELS ensures that Industry 5.0 technologies are not only advanced but also responsible, inclusive, and trustworthy.

Results & Expected Impact

The expected outcomes of CITADELS are both scientific and societal. On the scientific side, the project strengthens the research and innovation capacity of widening regions and therefore the Danube Region, equipping them with the tools and networks to participate more actively in European DeepTech ecosystems. On the societal side, it promotes attractive career pathways that motivate young professionals to stay and thrive in their home regions, thereby reducing the risk of brain drain.

Through structured career development, mentorship, and mobility opportunities, CITADELS contributes to the creation of a new generation of Industry 5.0 professionals – individuals capable of combining technical excellence with ethical awareness and social responsibility. The project also enhances technology valorisation and industrial uptake, transforming academic research into practical solutions that serve regional and global challenges alike.

Transferability & Scalability

CITADELS delivers a blueprint for talent circulation and testbed development that can be readily adapted across other European regions. Its methodologies for mapping testbeds, designing exchange programmes, and aligning training with industry needs are modular and replicable.

The project's career support guidelines and templates for DeepTech professional development can be implemented by universities, research organisations, and science and technology parks to strengthen their local innovation ecosystems. The scalability of the approach is ensured by its flexibility – it can be applied to various sectors and institutional contexts without losing its core principles of inclusivity and responsibility.

Barriers & Lessons Learned

CITADELS addresses several structural challenges, most notably the fragmented interfaces between academia and industry in widening countries. In many cases, researchers and businesses operate in isolation, with limited shared infrastructure or incentives for collaboration. Another barrier is uneven access to advanced testbeds and equipment, which hampers experimentation and reduces competitiveness.

A key lesson learned is the importance of balancing technology readiness levels (TRLs) across academic and industrial contexts to ensure smooth handovers. Equally important is the integration of social sciences and humanities (SSH) expertise to anticipate adoption barriers, ethical concerns, and social risks early in the innovation process. This balanced approach builds trust, encourages interdisciplinary collaboration, and increases the likelihood of sustained impact.

Sustainability Considerations

CITADELS embeds sustainability throughout its design and implementation. By investing in long-term career development and institutional capacity, it ensures that human capital remains a renewable resource within innovation ecosystems. The emphasis on responsible innovation and ethical awareness supports sustainable technological growth that benefits both people and the environment.

From a practical standpoint, CITADELS reduces environmental impacts through digital collaboration tools and optimised mobility schemes, while its governance structures promote transparency, openness, and interoperability. Ultimately, the project contributes to the sustainability of European innovation – not only through technological excellence but by nurturing the human dimension that underpins Industry 5.0.

Conclusion

The reason for CITADELS becoming an EUSDR PA 8 Lighthouse is simple: It combines DeepTech application with Danube Region-focused talent circulation and support in a specific field that tends to be shaped by brain drain intensively. In the end result, it is able to provide an impact that actively helps Danube Region talent find a perspective to stay.

5.2.9 EUPROGIGANT – EUROPEAN PRODUCTION GIGANET (GAIA-X)

Project Overview

EuProGigant is a pioneering initiative demonstrating how European manufacturing can achieve both data sovereignty and digital resilience through the application of GAIA-X principles. It establishes a multi-location, digitally connected production ecosystem that enables autonomous orchestration of value chains, where participating factories securely exchange data to optimise processes, mitigate risks, and enhance sustainability.

The project stands as the first industrial-scale implementation of GAIA-X concepts with public financial support. Developed by partners in Austria and Germany (lead: Pilotfabrik Industrie 4.0 TU Vienna and PTW TU Darmstadt), EuProGigant bridges industrial practice and European data infrastructure policy. It shows that open, federated, and interoperable data spaces can underpin the next generation of manufacturing networks – capable of self-stabilisation and continuous learning across borders.

By linking multiple production sites into a unified, trust-based digital environment, EuProGigant demonstrates that European industries can retain competitiveness while protecting strategic autonomy, avoiding vendor lock-in, and ensuring full compliance with EU values on privacy, security, and sustainability.

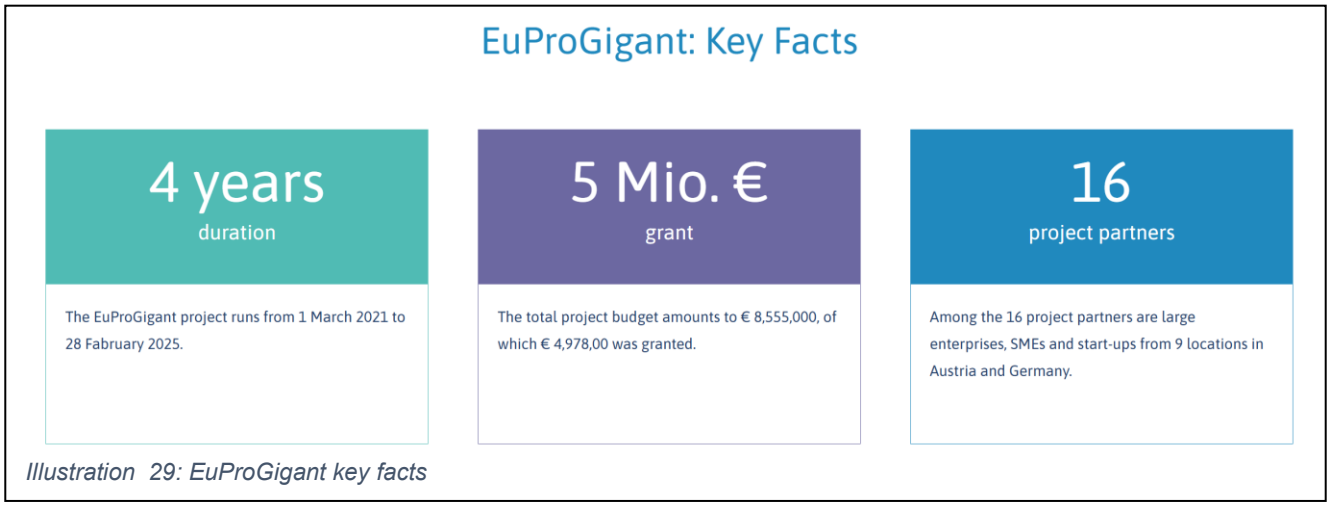

Illustration 29: EuProGigant key facts

Objectives

EuProGigant's objectives reflect a deep alignment with GAIA-X, the European initiative for federated data infrastructure.

- The first objective is to operationalise data sovereignty and interoperability among manufacturing enterprises, allowing each participant to control how and with whom its data is shared.
- The second objective is to enable calamity-avoiding, self-stabilising value chains, where shared data ecosystems automatically detect disruptions – such as supply shortages or equipment failures – and rebalance production dynamically.
- The third objective is to demonstrate the economic, technological, and environmental benefits of European, open, multi-cloud infrastructures that support sustainable, cross-factory collaboration.

Together, these goals position EuProGigant as both a technological demonstrator and a strategic enabler of Europe's industrial digital sovereignty.

Key Activities & Methods

EuProGigant's implementation strategy integrates technological development, governance design, and ecosystem building. Key activities include:

- Designing and implementing data-sharing patterns that respect GAIA-X principles of transparency, interoperability, and trust. These patterns define how data flows between production sites, machines, and service providers in a way that maintains sovereignty and traceability.
- Developing cross-site demonstrators that test self-stabilising mechanisms, such as dynamic reallocation of resources when a production site faces disruption.
- Establishing governance and compliance frameworks, defining roles, access controls, certification mechanisms, and contractual templates for secure collaboration across organisations.
- Creating learning ecosystems that enable industrial partners to experiment with digital twins, predictive maintenance, and AI-driven optimisation, using real-world data within the protected GAIA-X environment.

These methods ensure that the outcomes are not just technological proofs but replicable frameworks for data-driven collaboration in European manufacturing.

Innovative Aspects

EuProGigant's innovation lies in being the first practical industrial implementation of GAIA-X in manufacturing. While GAIA-X defines the vision of federated data infrastructure, EuProGigant translates it into operational reality through concrete use cases and demonstrators.

The project introduces self-orchestration patterns – mechanisms by which production networks autonomously react to changes in supply, demand, or capacity. For example, if one partner in the network experiences a machine breakdown, others can dynamically absorb production loads based on real-time data exchange.

By merging cyber-physical production systems, cloud-edge architectures, and secure data spaces, EuProGigant establishes a new paradigm for resilient, adaptive, and transparent manufacturing

ecosystems. This approach supports not only efficiency and cost reduction but also sustainability and long-term competitiveness.

Results & Expected Impact

The project delivers multiple layers of impact – technological, economic, and strategic.

- Technologically, it provides a validated reference architecture for implementing GAIA-X in industrial contexts.
- Economically, it empowers European SMEs and large enterprises alike to participate in digital value networks without ceding control of their proprietary data.
- Strategically, it strengthens Europe's industrial sovereignty, reducing dependency on non-European cloud providers and advancing standards-based collaboration models.

Expected outcomes include the creation of trusted industrial data spaces, frameworks for standardised data exchange, and the development of new value-added services such as predictive logistics, distributed quality management, and circular production tracking. The long-term impact will be a more sustainable and resilient European manufacturing landscape, capable of adapting to crises and global market fluctuations.

Transferability & Scalability

EuProGigant's modular architecture is designed for transferability. The templates for GAIA-X-compliant architectures, governance models, and data-sharing patterns can be reused across sectors such as energy, mobility, and healthcare. Each implementation can adapt the core components – identity management, trust services, and semantic data standards – to its own domain.

The project also serves as a catalyst for ecosystem formation, encouraging the creation of new data spaces aligned with GAIA-X throughout Europe. This open and federated model ensures scalability: as more organisations adopt the same standards, the collective value of participation multiplies exponentially.

Barriers & Lessons Learned

The complexity of multi-stakeholder governance emerged as one of the key challenges. Aligning incentives, compliance requirements, and technical capacities across different legal jurisdictions and business cultures required intensive coordination. Furthermore, harmonising data interoperability standards and ensuring mutual trust among participants demanded continuous dialogue.

Lessons learned include the importance of co-creating governance structures early, engaging both technical and legal experts from the start. Establishing standardised interfaces and certification mechanisms proved critical for ensuring interoperability. Finally, showcasing quick wins through pilot use cases helped attract new adopters and secure stakeholder commitment.

Sustainability Considerations

EuProGigant embeds sustainability at both environmental and organisational levels. The project promotes energy-efficient, resource-optimised production through real-time data-driven decision-making. By improving transparency and coordination, it reduces waste, logistics inefficiencies, and unplanned downtime.

On the institutional level, the project contributes to the long-term sustainability of Europe's digital economy by fostering open, sovereign infrastructures. The emphasis on interoperability, openness, and

human-centric governance ensures that the ecosystem remains adaptable and resilient to future technological or geopolitical challenges.

Ultimately, EuProGigant serves as a lighthouse for European digital sovereignty – demonstrating that industrial innovation can be competitive, sustainable, and value-driven at the same time. It transforms GAIA-X from a policy vision into an operational reality and lays the foundation for a new generation of trusted, federated manufacturing ecosystems across the continent.

Conclusion

The project was chosen as an EUSDR PA 8 Lighthouse because it empowers the European industry and supports its contribution to the sustainable development of Europe – which is fundamental for the competitiveness of enterprises. Specifically, EuProGigant illustrates the technological and economical use of the open, European multi-cloud infrastructure GAIA-X, which makes it a pilot for the Danube Region and the EU in total in a situation of large-scale dependency on outside services, which is strongly in line with the EU's strategic autonomy interests.

5.2.10 DAP – CREATION, INTRODUCTION AND TESTING OF DIGITAL TOOLS IN AGRICULTURE

Project Overview

The DAP (Digital Agriculture Platform) project represents a significant leap toward the digital transformation of greenhouse production systems in Bosnia and Herzegovina. It aims to enhance the productivity, sustainability, and competitiveness of small-scale farmers through the use of information and communication technologies (ICT), IoT-based monitoring, and a comprehensive digital management platform – PlastenikNET. The DAP Project represents an upgrade (for the years 2023-2024) of previously started research that is continuously implemented by the Faculty of Agriculture of the University of East Sarajevo in cooperation with various local partners.

DAP directly addresses the challenge of limited digitalisation in smallholder agriculture by offering accessible, affordable, and context-specific solutions that are co-developed with local farmers. Through the integration of hardware, software, and education, it empowers producers to manage resources more efficiently, optimise yields, and strengthen their market position. The initiative is grounded in inclusivity, seeking to ensure that marginalised groups and rural communities can participate in and benefit from the digital transition of agriculture.

Objectives

The project's objectives align with regional strategies for agricultural innovation, digital readiness, and sustainability.

- The first objective is to increase the competitiveness and digital readiness of greenhouse producers, particularly smallholders who often lack access to high-tech solutions.
- The second is to bring ICT solutions closer to marginalised and rural groups, using tailored training and advisory services that lower the barrier to adoption.
- The third objective is to strengthen collaboration between academia and practitioners, ensuring that innovation in agricultural technology is guided by real-world needs and supported by ongoing research and education.

By combining applied research, training, and digital infrastructure, DAP builds a self-sustaining ecosystem of learning and innovation that extends well beyond the project's lifespan.

Key Activities & Methods

DAP's implementation is structured around practical and educational activities designed to test, validate, and expand the PlastenikNET platform:

- Ten greenhouse installations were equipped with IoT-based monitoring and management systems, enabling real-time data collection on temperature, humidity, and soil parameters.
- The PlastenikNET platform serves as the project's central hub, integrating modules for administration, monitoring, advisory services, education, and a discussion forum. This multi-functional structure allows both farmers and advisors to track performance, receive recommendations, and share knowledge.
- Extensive capacity-building activities accompany the technical roll-out: three hands-on workshops and eight educational sessions introduced farmers to digital tools, while manuals and video tutorials provided accessible resources for continued learning.
- Continuous research and development are conducted in university greenhouses, ensuring that PlastenikNET evolves in response to user feedback and emerging technologies.

Through this multi-layered approach, DAP ensures that farmers not only gain access to technology but also acquire the skills and confidence to use it effectively.

Innovative Aspects

DAP's most distinctive innovation lies in its integrated technology–training model, which treats digitalisation as both a technical and a social process. The combination of IoT monitoring systems with an inclusive digital learning platform creates a feedback loop between data, decision-making, and knowledge.

Farmers can access real-time environmental data, receive expert recommendations, and interact with peers and advisors through a single interface. This design enhances decision quality while promoting collective learning. The participatory co-development model – where users actively shape the tools they use – ensures that adoption is not merely technological but also cultural and behavioural.

Furthermore, by embedding research within education, DAP establishes a long-term innovation infrastructure. The faculty's greenhouses function as living laboratories, supporting student research, pilot testing, and knowledge transfer to local agricultural communities.

Results & Expected Impact

The project has achieved tangible outcomes at multiple levels:

- Technological uptake: Greenhouse operators now actively use digital monitoring and management tools to optimise growing conditions and reduce resource waste.
- Educational resources: The creation of manuals, online tutorials, and a dynamic PlastenikNET platform ensures that learning continues after the project's completion.
- Institutional capacity: The Faculty gained new research capabilities in agricultural informatics, positioning it as a regional leader in digital agriculture.
- Community engagement: Stronger linkages were built between academia, local communities, and private sector actors, fostering a culture of innovation and continuous improvement.

In the long term, DAP contributes to increased agricultural resilience, efficiency, and environmental sustainability – all critical priorities for the Danube and Western Balkan regions.

Transferability & Scalability

The DAP model is inherently modular and scalable. Its flexible architecture allows adaptation to a wide range of greenhouse types, crops, and regional contexts. Because it uses open, interoperable technologies, other universities, SMEs, or public institutions can replicate and extend the system with minimal modification.

Scalability is also supported by the project's co-development methodology, which emphasises collaboration between universities, technology SMEs, and farmers. This approach ensures that new implementations remain relevant to local needs while maintaining the core functionality and structure of the PlastenikNET platform.

Barriers & Lessons Learned

Implementing digital solutions in small-scale agriculture presented notable challenges. The customisation of hardware and software for varied greenhouse setups was resource-intensive, requiring close technical support. Additionally, early-stage market adoption among farmers demanded persistent outreach and awareness-raising to overcome scepticism toward new technologies.

The main lesson learned is that user engagement from the beginning is crucial. Co-designing systems with end-users not only improves functionality but also builds trust and a sense of ownership. Another key takeaway is that affordability and ongoing advisory support are essential for long-term success, especially in regions where financial and technical capacities vary widely.

Illustration 30: DAP Testing Site

Sustainability considerations

Sustainability is embedded in DAP's design through environmental efficiency, social inclusion, and institutional continuity. The IoT systems optimise energy and water use, directly reducing the environmental footprint of greenhouse production. The training and governance mechanisms established by the project ensure that both knowledge and infrastructure remain accessible and functional beyond the initial funding period.

By promoting open data standards and collaborative development, DAP ensures interoperability and long-term maintenance. Its human-centric approach empowers smallholders to embrace sustainable innovation, thereby reinforcing the region's capacity for green and digital transformation.

In essence, DAP exemplifies how technology, education, and community engagement can combine to drive equitable, sustainable, and digitally empowered agriculture – turning small farms into smart, resilient producers ready for the challenges of the 21st century.

Conclusion

For the reason of its on-the-ground approach to innovation in a sector that lacks the widespread uptake of digital technology so far, DAP was chosen as an EUSDR PA 8 Lighthouse for Bosnia and Herzegovina. Even though not introducing exclusively new technology, the idea of bringing technology application together with user-friendly platforms like DAP aims at is an important booster for the competitiveness of enterprises in the Danube Region.

5.3 SUPPLY CHAINS & FINANCE

5.3.1 SUPPLY CHAINS

5.3.1.1 MASTER STUDY PROGRAMME SUPPLY CHAIN MANAGEMENT, LOGISTICS, PRODUCTION

Programme Overview

The Master Study Program in Supply Chain Management, Logistics, and Production, offered by the Dual University of Baden-Wuerttemberg, stands as one of the few initiatives within the Danube Region that integrates academic learning with the traditionally industry-driven supply chain sector. A distinctive feature of this programme is its vocational, job-integrated structure, allowing participants to pursue advanced studies while maintaining their current professional roles.

The Centre for Advanced Studies is a distinguished institution affiliated with the Baden-Württemberg Cooperative State University (Duale Hochschule Baden-Württemberg, DHBW), recognised as the largest cooperative university in Germany. Its primary focus is on master's-level education and continuing professional development. Instruction is delivered partly in Heilbronn and partly across other DHBW campuses. DHBW CAS provides 18 part-time and work-integrated master's degree programmes spanning business, engineering, social work, and health sciences.

Participants of the Supply Chain Management, Logistics, and Production study programme are encouraged to apply theoretical knowledge directly within their professional roles, thereby integrating real-world challenges into their academic experience. With a comprehensive selection of modules, students are able to customise their studies according to their prior experience, career objectives, and personal growth aspirations. This approach facilitates direct application of acquired knowledge, promotes deeper learning, and enhances career development prospects, which are pivotal for the attractiveness of the programme for postgraduate studies.

Funding

The primary funding partner for this study programme is the Dieter Schwarz Foundation. It offers substantial support to the Centre for Advanced Studies by furnishing facilities and resources at the Education Campus in Heilbronn. For the basics, still, the DHBW CAS study programmes are predominantly financed through tuition fees. Additionally, since 2014, the Dieter Schwarz Foundation has contributed financial assistance linked to the centre's establishment on the Education Campus. Having started for this study program in 2015, this support was initially set to conclude in September 2020 – it has been extended and will now remain in effect, as of the summer of 2025, at least until the end of 2025.

Study Programme Approach

Companies and institutions participate in the dual master's programmes at DHBW CAS as dual partners, contributing to the integration of practical experience with academic study. These organisations are regarded as stakeholders within the university framework. The aim is to jointly support the qualification and professional development of employees to prepare them for future requirements.

Participation in a dual master's programme requires formal approval from the employer as a dual partner, which is provided through a one-time registration process with DHBW CAS and is necessary for employee enrolment. At the bachelor's level, more than 250 companies serve as dual partners for

SLP (Supply Chain, Logistics, Production), though not all of these partners offer a dual master's at this point in time.

As mentioned above, the dual master's program is job-integrated and vocational, allowing students to stay employed while studying. The flexible, practice-oriented curriculum can be tailored to individual needs, with students working full-time, attending 2–3-day block lectures, and completing three scientific consulting projects for their employer. Most programs at DHBW CAS start in either the summer or winter term, last for four terms, and are open to graduates from all higher education backgrounds.

Currently (as of summer 2025), new dual partners are joining the program, and evaluation is going on regarding all lectures and seminars, also considering teaching the most contemporary industry and scientific knowledge possible.

Study Contents and Admission

The curriculum prepares students for complex responsibilities involved in managing logistics processes. Graduates will possess the skills necessary to ensure seamless integration across all stages of the value chain. They acquire comprehensive knowledge of procurement, production, and distribution management, including strategies for navigating complex scenarios.

Illustration 31: DHBW CAS

Participants gain both technical and organisational proficiency required for effective planning, control, and execution of logistics functions within their current or future workspaces. This expertise ensures smooth operation across value chain links. Eligible applicants include holders of a bachelor's degree in economics or business from any university, with at least one year of professional experience, seeking specialised advancement. The programme is well-suited for employees in industry, trade, consulting, software development, and logistics service provision who aspire to tackle complex tasks related to design, coordination, planning, and control within value chains. Therefore, a considerable degree of openness for newcomers to the specific field of supply chains is given.

Having operated successfully for more than ten years, the programme has achieved significant milestones: establishing the dual master's format (distinct from the dual bachelor's three-month rotation

between company and university), defining credit requirements, implementing “Bridging Theory and Practice,” and advancing internationalisation efforts.

Impact and added Value

The added value of a dual master’s program like the one offered by DHBW CAS in Supply Chain Management, Logistics, and Production lies in several key areas. It brings together academic theory and practical application, creating a dynamic learning environment where students can immediately relate concepts to real workplace challenges. This ongoing interaction between academic content and professional tasks not only reinforces comprehension but also makes retention more effective. The modular structure of the programme enables participants to select modules that align closely with their current roles and personal career ambitions.

As a result, graduates are well-prepared for advanced responsibilities in supply chain coordination, planning, and management. Collaborative study among logistics professionals, coupled with opportunities to join lectures from other programs, helps students broaden their professional networks.

Employers also benefit from the program, as employees contribute up-to-date knowledge and innovative solutions directly to their organisations. Support for continuing education often fosters greater loyalty and long-term commitment from staff members, on top of the solutions that companies can get from their employee’s newly gained knowledge. Importantly, flexible module selection ensures that both individual and organisational needs are met, with course choices decided jointly by students, their companies, and programme coordinators. The exchange of perspectives and industry practices is continuous, encouraged by employees sharing insights at work.

DHBW’s dual master’s programs are fully accredited, meeting rigorous national and international standards. Although semesters abroad are currently unavailable, students benefit from international field trips and exposure to global experiences, with plans underway to integrate EU4Dual university alliance elements into the curriculum. Faculties drawn from various DHBW locations further enrich the program with diverse expertise, helping create a comprehensive learning experience.

Replication Tips and Outlook

Involving all relevant stakeholders early on when setting up a dual study program is a key to success – the list should include academic staff, partner companies, and relevant authorities. Identifying the needs of employers and students, determining which faculties are interested, and proceeding from there should be marking the start of any replication effort of the Supply Chain Management, Logistics, and Production study programme.

Grounded in practical relevance and tailored specifically for supply chain professionals, this model has proven successful for over a decade. As an EUSDR PA 8 Lighthouse, it exemplifies replicable best practices and supports the cultivation of a new generation of industry-integrated researchers, project managers, and strategic planners equipped with essential expertise to drive enterprise competitiveness. Constant study content and methodology evaluation is the only way to ensure long-term sustainability of these benefits.

5.3.1.2 GLOBAL VERANTWORTLICH BW – LIEFERKETTEN NACHHALTIG GESTALTEN

Project Overview

"Global verantwortlich BW" ('globally responsible BW – shaping sustainable supply chains') is an initiative that is directed at mostly SME enterprises specifically in the German Baden-Württemberg region that shows them ways to manage their supply chains with a stronger focus on taking responsibility for the consequences of their management. The main format is knowledge dissemination and exchange by a number of event formats and online handbooks, as well as practical workshops helping enterprises understand the options and strategies that they could make use of. Moreover, events for specific company networks play an important role in the initiative's portfolio.

Sustainability is the core of the topics tackled by the initiative. By discussing the ways of shifting supply chains in a productive manner that does not compromise competitiveness but rather increases it by making new and sustainable supply chains more resilient to external shocks, global verantwortlich BW adds an important element to the support as well as networking infrastructure directed at enterprises in the Baden-Württemberg ecosystem. This, at the same time, is a replicable approach and therefore the reason for it becoming an EUSDR PA 8 Lighthouse.

The regionally based program, which is freely accessible, assists companies from Baden-Württemberg with the implementation of sustainable supply chain management in accordance with current regulatory requirements. Its focus moreover includes supporting respect for human and environmental rights throughout global supply chains. Global verantwortlich BW offers different event formats to facilitate interdisciplinary discussions among companies, policymakers, and members of civil society. Presenting a range of practical solutions from multiple perspectives, it enables stakeholders to consider these options when making decisions about sustainable supply chain management.

Global verantwortlich BW is being operated by UPJ e.V. which is a Network for corporate responsibility and social engagement operating with many domestic partners and in many different projects. The project is funded by the Baden-Württemberg Ministry of Economic Affairs, Labour and Tourism. It has been operational since 2021 and continues to be.

Main Activities

In the context of regulatory due diligence obligations in global supply chains, the global verantwortlich BW programme is aimed at supporting SMEs in Baden-Württemberg in developing and implementing responsible value and a supply chain management in a globally competitive environment. This free support programme focuses on company networking, peer learning and interdisciplinary dialogue at various events.

One of the central offers of the project is its company network: Free of charge, participants can join representatives of Baden-Württemberg companies in practical work on their own sustainable supply chain management, developing it further in various peer learning formats. Therefore, the following formats are being applied:

- On the one hand, the project's workshops are designed to be implementation-oriented and include opportunities for peer-to-peer exchange and sharing of knowledge. Through practical input, group work and exchange formats, participating companies are shown suitable, multi-faceted and effective methods for integrating environmental and human rights due diligence obligations into their own corporate practice along global value and supply chains without reducing their competitiveness.

- Moreover, online network meetings provide a framework for knowledge transfer among global verantwortlich BW network participants. The meetings focus on peer-to-peer exchange.
- Furthermore, video consultations are a format in which an expert meets with participants to answer questions on specific issues submitted in advance. Video consultations also provide a space for confidential, peer-to-peer dialogue with a high degree of individualisation.
- Finally, mutual support in dyads is being provided: Within groups of two, practitioners from the participating companies provide each other with confidential, collegial advice on issues that have been previously defined.

Public events and online seminars highlight the implementation options and challenges of sustainable value and supply chain management and discuss current and future regulatory requirements from the perspective of various stakeholders.

As a key activity of the project with very easy access, an online guide offers company representatives a step-by-step manual to implementing sustainable supply chain management supporting them in paying greater attention to human and environmental rights within their supply chains. It compiles important information, good practice examples, and further guidelines on the process steps of sustainable supply chain management. It also provides an overview of current developments in supply chain regulation. For company representatives using the guide, this provides clear guidance and practical advice on how to make their supply chains sustainable.

The guide also explains how companies can quickly move into the implementation phase, particularly regarding practical corporate social responsibility risk management along their supply chains. This may apply in the event of customer enquiries, growing pressure from civil society or as part of their own corporate social responsibility strategy.

Illustration 32: global verantwortlich BW Events

Impact

Global verantwortlich BW enables supply chain experts to look beyond their own company's horizons. It facilitates collegial exchange and knowledge transfer in a trusting environment with experts from a wide range of companies of all sizes and industries. The various event formats provide practical

knowledge and skills for effectively implementing sustainable supply chain management, particularly within the current regulatory framework. This helps companies to better address human rights and environmental risks within their (global) supply chains.

For further transparency and visibility, the project provides the section “Gute Praxis” translating into “good” or “best” practice, where the impact reached within specific projects can be observed in more detail. Companies that have used the global verantwortlich BW offer to talk about and further develop their sustainable management of supply chains are presented with their individually implemented measures. As an example, the Baden-Württemberg-based chocolate company Alfred Ritter GmbH & Co. KG represents an industrial branch that for a long time was in trouble regarding its supply chain practices and respectively faced criticism regarding it on many levels.

However, within the framework of the project, Ritter has made its cocoa supply chain transparent and traceable for producer organisations, building several direct partnerships over a course of 35 years. Over 70% of its cocoa soon came from these sustainable partnerships, with the goal to reach 100% by 2025. The company supports sustainable farming programs in origin countries and participates in multi-stakeholder initiatives to promote interdisciplinary exchange, especially on topics like deforestation and farm management.

This example shows in what ways networking within the global verantwortlich BW initiative enables companies to learn from one another, reflect on their own practices, and share expertise in sustainable supply chain management. Collaborative exchange strengthens public positioning and supports collective progress in meeting due diligence requirements – contributing to goals that are inherently in corporate interest.

Outlook and possible Adaptations

The programme could be adapted for larger regions, such as entire federal states or metropolitan areas, as well as smaller areas, such as cities and municipalities. It provides an established and tested, but also flexible approach to address the issue and to activate stakeholders in a way that can generate impact. Realising the multiple benefits that companies may gain from focusing on the sustainability issue is something that massively profits from the experiences of a network, regardless of the scale and political level on which it may be established.

Being an EUSDR PA 8 Lighthouse, global verantwortlich BW effectively showcases in what ways the interdisciplinary exchange between companies, policymakers and civil society is able to make a difference for the whole supply chain – and therefore contributes to a fairer and at the same time competitive economy within the Danube Region and with partners outside of it.

5.3.1.3 DIGITALNA FIRMA - ONEX DIH BOSNIA & HERZEGOVINA – NEXTGEN ERP

Project Overview

The NextGen ERP program of ONEX in Bosnia and Herzegovina was a specific offer of the ONEX competence network of experts on business development and digital transformation for SMEs. Therefore, it offered companies targeted services and planning how they can realistically and practically tackle their own digital transformation potential, with a specific focus on enterprise resource planning (ERP). Remarkably, this offer was not directed to a specific size of company. The analysis of funding

options for each individual transformation project and screening of realistic options played a major part. The project was running from 2023 until 2024.

As main objectives, NextGen ERP was directed at digitalising and automating core business processes, reducing the reliance on fragmented legacy systems, enhancing data transparency through real-time analytics and always packaging these solutions as examples for many more SMEs and other enterprises in Bosnia & Herzegovina – with a supply chain dimension, in these transformation options, always included. This wholesome approach provides the reason for ONEX NextGen ERP Bosnia and Herzegovina becoming an EUSDR PA 8 Lighthouse: It created a visible approach with concrete results for enterprises that could be replicated relatively easily in other parts of the Danube Region. SMEs, as many questionnaires and interviews in several projects over the years have shown, express the need for orientation in the jungle of financial and non-financial support options and narrowing down a broad range of transformation investment options. As an important lasting benefit of the project, it's platform and network are ongoing and were not terminated with the project end in 2024.

Network and Partners

The project titled "Development and Implementation of the ERP (Enterprise Resource Planning) System" was executed through a coordinated collaboration among several key partners. The primary partnership consisted of DIH ONEX Bosnia and Herzegovina, serving as the digital transformation facilitator and technical coordinator, and the European Bank for Reconstruction and Development (EBRD), which provided financial support via its Go Digital programme. A certified ERP solution provider was retained to oversee the development, customisation, and implementation of the software, while an external business consultant ensured alignment with the organisations' operational workflows.

Furthermore, three local enterprises (Pecic Kommerce d.o.o., DSD Projekt d.o.o., and Velmainex d.o.o.) were instrumental in supporting the initiative. Despite operating in distinct sectors, these companies, all located in the town of Derventa, consolidated their resources and efforts to advance the creation of a foundational ERP solution. Their collaborative approach was designed to produce a scalable and adaptable system capable of future customisation to meet the unique requirements of diverse industrial SMEs. This model of cooperation not only enhanced the competitiveness of the participating firms but also facilitated the development of a reusable digital solution for the broader SME sector.

Funding

As mentioned above, the project development and implementation of the ERP System was financed through the EBRD's Go Digital programme, which supports SMEs in advancing their digital transformation. Through this programme, the companies received both financial and expert support to implement an ERP system tailored to their specific business needs. The Go Digital initiative enabled access to high-quality consultancy services, co-financing of project costs, and alignment with international best practices in digitalisation, significantly contributing to the project's successful implementation and long-term impact.

The total funding amount for the Development and Implementation of ERP System project was 60,000€. This included the costs of expert consultancy services, ERP software licensing, customisation, staff training, and initial implementation support. The co-financing through the EBRD Go Digital programme provided substantial support in reducing the financial burden on the SME and ensuring the project's successful delivery.

Work Package Structure and Objectives

The Development and Implementation of the ERP System project was structured around several key activities designed to ensure the successful creation of a scalable and modular ERP solution tailored for SMEs. One of the most interesting aspects of the project was its collaborative approach, where the three companies from different sectors (named above) jointly contributed to the definition of functional requirements, reflecting diverse operational needs – which is why this project deliberately followed a bottom-up approach. This model allowed the development of a versatile ERP base platform that could later be customised for various industrial applications.

Core objectives included digitalising and automating core business processes such as finance, procurement, inventory, and HR management; reducing reliance on fragmented legacy systems by integrating all operations into one unified platform; enhancing data transparency and decision-making through real-time analytics and centralised data flow; and creating a cost-effective, scalable solution that could serve as a model for other SMEs in the region.

The project's work packages covered needs assessment, architecture and development, pilot implementation, training, and scalability planning, ensuring practical results and future adaptability. In detail, these work packages were structured around needs assessment and business process mapping (WP1), software architecture and module development (WP2), pilot implementation in the three companies (WP3), training and user onboarding (WP4), and performance evaluation and scalability planning (WP5). This structure enabled the project team to balance technical development with practical application, ensuring that the final solution met real-world business demands while offering flexibility for future adaptation.

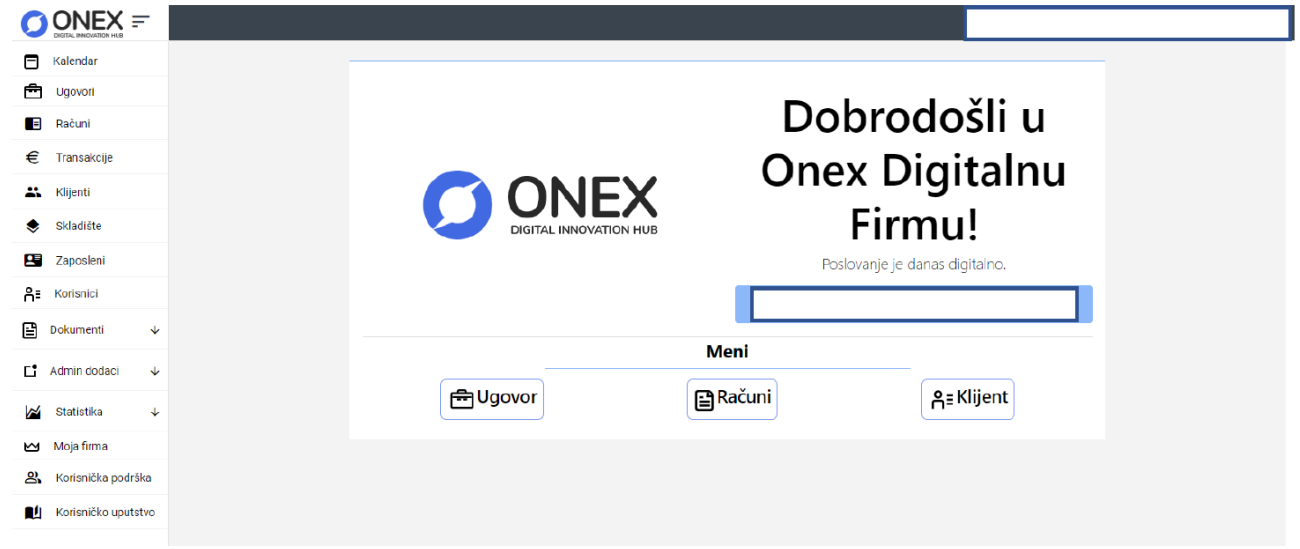

Illustration 33: ONEX User Platform

Methodology

The project development and implementation of the ERP System within the SMEs applied a collaborative, user-driven, and iterative methodology to ensure that the final ERP solution addressed the real needs of the participating SMEs. The approach combined elements of agile project management, design thinking, and business process reengineering (BPR).

Initially, the project began with a comprehensive needs assessment and process mapping phase, during which DIH ONEX facilitated structured workshops with representatives from the three partner companies to define their operational pain points and digitalisation priorities.

This was followed by an iterative development process where the ERP software was built in modular units, tested in cycles, and refined based on continuous user feedback. Agile sprints allowed the development team to quickly incorporate adjustments and ensure a functional and user-friendly system. In parallel, BPR methods were applied to optimise existing workflows before their digital transformation, ensuring that inefficiencies were addressed rather than simply digitised.

The project also emphasised capacity building, with structured training sessions and mentoring to ensure smooth adoption and long-term usage. Evaluation and performance monitoring were conducted throughout the project to measure improvements in efficiency and identify opportunities for further enhancement. This structured yet flexible methodology ensured a tailored, high-impact ERP solution with strong buy-in from all partners.

Impact and added Value

The development and implementation of the ERP System project generated impact both for the participating companies and for the broader SME ecosystem in the region. For the three companies participating, the introduction of a tailored ERP solution resulted in improved operational efficiency, better inventory and financial control, enhanced internal communication, and reduced administrative workload. By replacing fragmented legacy systems with a unified digital platform, these companies gained real-time access to critical business data, enabling faster and more informed decision-making.

Beyond the immediate benefits to the pilot users, the project has created a reusable and adaptable ERP base model that can be further customised for other SMEs in various industries. This provides a valuable resource for the local business community and contributes to regional digital transformation goals. Furthermore, the collaborative and demand-driven development approach fostered by DIH ONEX showcases a sustainable innovation model, where multiple SMEs co-invest in digital tools that reflect their shared needs – thus lowering costs, increasing usability, and boosting overall competitiveness. The project also strengthened the local innovation ecosystem by involving digital experts, consultants, and the EBRD's Go Digital programme, demonstrating how coordinated support can accelerate SME modernisation in a support system that is not necessarily based on a financing solution.

Outcomes and Outlook

As of now, the Development and Implementation of the ERP System project has achieved several concrete results with visible benefits for all participating stakeholders. The newly developed ERP solution has been successfully implemented in the three partner companies, leading to significant improvements in workflow efficiency, data management, and internal coordination. Key business functions such as finance, inventory, procurement, and HR are now integrated into a single digital platform, reducing manual work, minimising errors, and enabling real-time decision-making.

One of the most valuable outcomes is the creation of a flexible ERP base model that can be scaled and customised for other SMEs, particularly in differing industrial sectors. This makes the solution highly replicable and adds broader regional value beyond the initial implementation. The project also reinforced the effectiveness of collaborative digital development, where multiple SMEs co-design solutions tailored to shared challenges.

Conclusions drawn from the project so far highlight the importance of user involvement from the earliest stages, the need for localised customisation of digital tools, and the value of combining financial support with expert facilitation – an important learning for financial support systems in general. In its co-creation of DIH ONEX steering and support from the EBRD Go Digital programme, the project stands as a successful example of how targeted digital transformation efforts can strengthen SME competitiveness and foster sustainable innovation in the Danube Region.

Barriers and Replication Tips

One of the main challenges was the lack of internal digital readiness within the participating SMEs, including limited IT infrastructure and varying levels of digital skills among staff. This required additional time and effort for training and change management to ensure successful adoption. Another significant barrier was the difficulty in aligning diverse operational needs from three companies in different industries into a single ERP framework. Balancing standardisation with customisation was essential, as the agile methodology helped manage this complexity.

Despite these challenges, the project proved that joint development among SMEs is a powerful model for cost-effective digital innovation. For future replication, it is recommended to engage SMEs early through co-creation workshops, invest in structured onboarding and user training, and ensure strong facilitation by a neutral innovation intermediary such as a Digital Innovation Hub. Moreover, leveraging support programmes like EBRD Go Digital can significantly reduce the financial and technical burden for SMEs.

A key tip for similar initiatives is to start with a scalable and modular ERP design that can be easily expanded or tailored later, allowing for flexibility without compromising core functionality. Finally, showcasing successful pilots in local contexts can motivate other SMEs to engage in digital transformation, creating momentum for broader regional replication.

Being scalable and replicable especially with regard to the shared cost model and the methodology of working with the SMEs, NextGen ERP became an EUSDR PA 8 Lighthouse because it was a project streamlined towards the long-term needs of SMEs and therefore the core of competitiveness of enterprises in the Danube Region, fostering digitalisation, forward-thinking and processual optimisation. It may be a digitalisation project as well, but its support system approach is something that is most crucial especially in the field of supply chains and finance and could be replicated with regard to other kinds of transformation efforts as well – which it was included in this study chapter.

5.3.1.4 ASCII - SUPPLY CHAIN INTELLIGENCE INSTITUTE AUSTRIA

Project Overview and Partnership

The Supply Chain Intelligence Institute Austria (ASCII) is an institution funded by the Austrian national government and marks a new path in proposing an offer to companies with regard to the topic of Supply Chains: It is an institute that works with the sole and clear focus on the issue of forming, reforming and managing supply chains. Geopolitical pressure and factors of many kinds in the last few years have forced many enterprises in the Danube Region and beyond to consider the volatility of their own supply chains much more than before. This research institute is dedicated to providing analyses to better address future challenges related to value networks, strategic interdependencies, and ensuring production and supply security. The aim is to provide decision-makers in politics, administration and

industry with a solid basis for achieving the Austrian and European goals for secure value creation and environmental responsibility.

Working closely together with the Austrian Institute of Economic Research, the University of Applied Sciences Upper Austria and the Complexity Science Hub as well as the Verein Netzwerk Logistik, ASCII offers stakeholders and enterprises a clear path to reaching their own structure of secure value creation, coupled with a green transformation approach as it also considers how to make new supply chains more sustainable.

The institute pursues the vision of supporting economic policy decisions in Austria and the EU through well-founded analyses, particularly on matters relating to supply chains and production networks. Its goal is to generate direct, practice-oriented knowledge in the field of value networks and their transformation processes, as well as to integrate these insights into the macroeconomic context. At the same time, ASCII aims to continuously expand methodological expertise to address the complexity and dynamics of global value chains. Another focus is the international orientation of training the next generation of researchers. The institute's results achieve a broad impact thanks to close collaboration between politics, business, and science.

This new and streamlined approach, as well as the productive output in terms of e.g. studies on certain supply chain issues makes ASCII an EUSDR PA 8 Lighthouse, as the competitiveness of enterprises can only benefit from this generation of knowledge.

Funding

ASCII is funded by the Austrian Federal Ministry of Labor and Economy and the Provincial Government of Upper Austria with 10 million Euros in the current period of funding, which began in 2023 with setting up the institute and will end, for the current funding basis, in 2028.

Main Activities and Methods

ASCII provides early warning systems & scenario analyses to make vital supply chains resilient and increase supply security - in Austria and Europe. Only 6% of companies, according to ASCII's research, know about their entire supply chain, and less than 1% of global supply relationships have ever been monitored. ASCII creates the first reliable data basis for making supply chains visible, controllable and sustainable. In that sense, it generates knowledge for companies and policymakers that previously simply did not exist.

On that basis, ASCII supports policymakers and companies with specific risk analyses and tools to implement regulatory obligations efficiently and with legal certainty.

Through interdisciplinary knowledge from data and network science, international economics, management science, logistics and supply chain intelligence, ASCII processes millions of data points – from trade flows to corporate networks – using AI-supported network analysis, real-time early warning systems and scenario modelling.

Strongly relevant for the public and all interested in the results of the institute's work, there is a section on their website which presents publications and papers that have been put together by the ASCII team. They combine expert circle information with a non-scientific style read that is open to the public and marks a strong information basis on the many issues that supply chains are related to.

Some recent topics that can be read about include the following:

- Systemic Trade Risk Suppresses Comparative Advantage in Rare Earth Dependent Industries
- The Strait of Hormuz: What Could a Blockade Mean?
- Potential Future Pathways in the Battery Supply Chain – An Upper Austrian Perspective
- Impact of US-China Tariffs on Maritime Transport
- Global Demand and Supply Elasticities and the Impact of Tariff Shocks
- Adaptive Shock Compensation in the Multi-layer Network of Global Food Production and Trade

Moreover, ASCII has developed an Austrian Supply Chain Index in order to better quantify and analyse supply bottlenecks that affect the Austrian economy. It signals the level of stress in the international supply chains of Austrian industrial companies and is regularly updated – an overview on its development can be seen in the visualisation below, with higher values marking phases of an increased level of stress in the international supply chains of Austrian industrial companies.

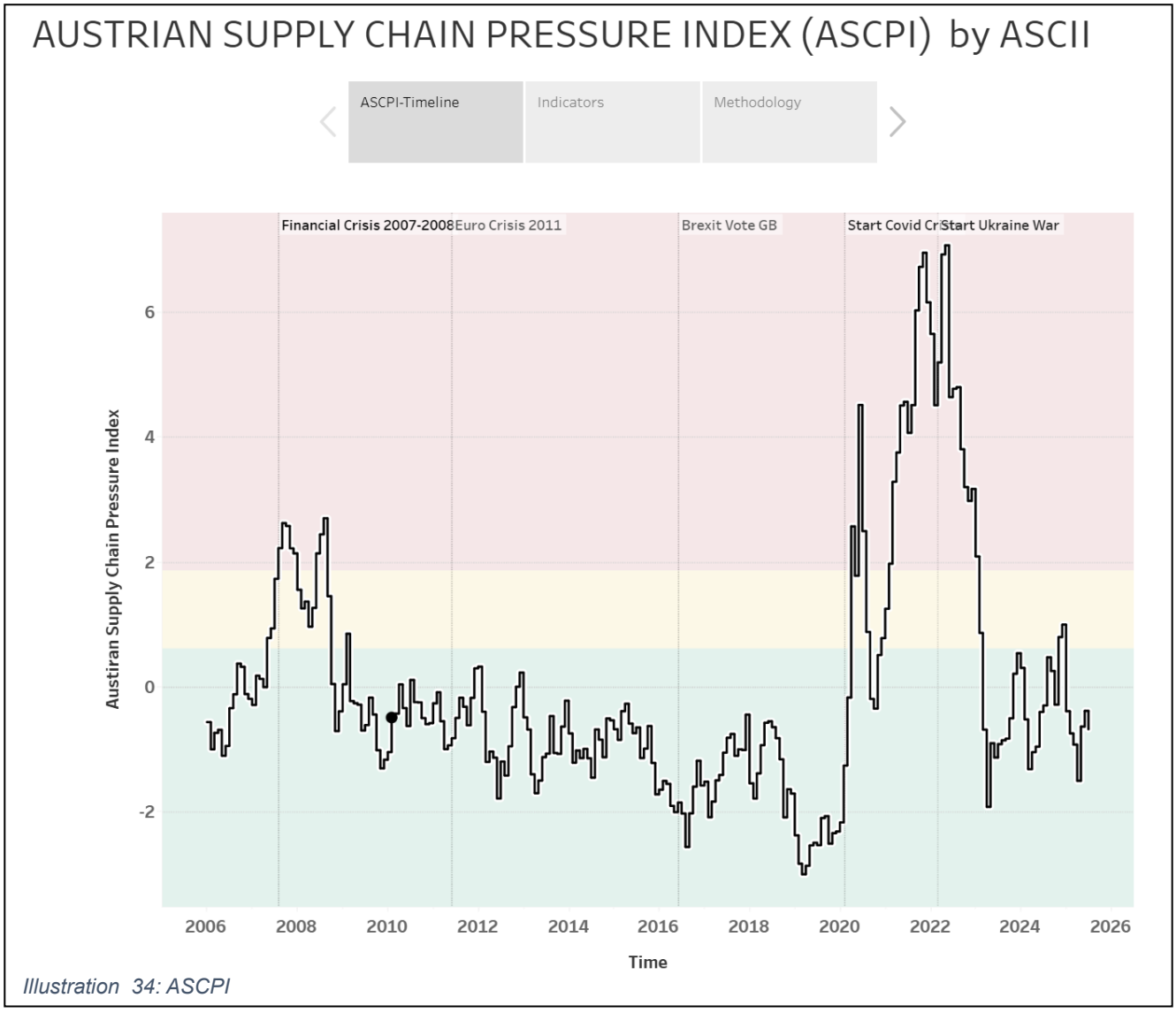

Illustration 34: ASCPI

Impact and added Value

ASCII provides data-based orientation for decision-makers and industries to support supply security, location strategy and crisis prevention, thus strengthening the strategic ability to act for resilient, sustainable and competitive economic structures in Austria and Europe.

The research joint venture analyses value creation networks and strategic dependencies to support secure production and supply. The team maintains a database for simulating supply chain scenarios and developing strategies for a resilient, sustainable economy. Their goal is to provide evidence-based insights for decision-makers to help achieve Austrian and European objectives related to secure value creation and CO_2 neutrality.

Outlook and Replication

ASCII potentially is the only research institute in Europe and one of the few worldwide that analyses complex production and logistics networks in a holistic, data-based and interdisciplinary way. It is the only supply chain research institute that combines data and network science, economics, management science, and logistics to develop cutting-edge data-based analytical tools.

This standalone character should be seen as surprising: The need for companies, policymakers and all other relevant stakeholders to gain knowledge and data-based reliable information about their current and prospect future settings with regard to supply chains is something that is present not only in Austria, but throughout the Danube Region and, frankly, in a global setting. It does not only assist to anticipate possible lacks in the supply chain structure and, in that way, helps to pre-mitigate exogenous shocks, but it is able to increase productivity and reduce costs while at the same time increasing sustainability levels, even without the factor of geopolitical factors, pandemics or other shocks.

Therefore, replication in this case is not only an option, but rather a necessity. To have a showcase example of how such an institute can be developed, in what institutional setting, size and with which profile of services is an obvious reason to have ASCII as one of the 30 EUSDR PA 8 Lighthouses.

5.3.1.5 RETHINK-GSC

Project Overview and Partnership

The RETHINK-GSC project tackles the focus point of EUSDR PA 8 at its very core: It focuses on analysing not only the structure of supply chains in general in the Danube Region and the European Union, but it actively engages and works with enterprises to identify their potentials regarding supply chains. New methodologies are needed in order to raise effectiveness and therefore competitiveness regarding the way especially SMEs work with partners. Also, the question of social, economic and environmental outcomes of different supply chain structures is worth analysing. A special emphasis of the project is based on immaterial goods and their role in our current and future economy.

This hands-on approach directly involving SMEs makes RETHINK-GSC a project that is destined to increase competitiveness of enterprises in the Danube Region and therefore underlines its role as an EUSDR PA 8 Lighthouse.

The project partnership is rooted across Europe: Partners from Ireland, Norway, Denmark, Belgium, France, Poland and Italy are included. The project is coordinated by the Kiel Institute for the World Economy in Germany. It receives a total of 2.999.877,75 € out of Horizon Europe. Two major project

partners are situated in the Danube Region: The Austrian Institute of Economic Research (WIFO) and the Centre for Economics and Regional Studies in Hungary (KRTK). In total, the project is being implemented by eleven partners. The running time of RETHINK-GSC is from 2022 until 2025.

The key objective of the, for the study topic of supply chains, most relevant work package is to conduct a company survey exploring knowledge flow between firms and their suppliers, their responses to global supply chain shocks and adaptation strategies. The aim is to understand the impact of current developments such as the energy crisis, geopolitical tensions and new due diligence requirements on production and procurement networks, as well as the risk and resilience of supply chains. The survey is also being conducted in other EU countries to analyse cross-border trends. The survey helps to provide valuable insights that will serve as a basis for economic policy options at the national and European level.

Main Activities and Work Packages, Survey Methodology

Researchers from eleven institutes combine their expertise in a multidisciplinary approach. Their collaboration enables RETHINK-GSC to recognise, measure and quantify the growing role of intangibles in global supply chains and production. Innovative methods are applied to analyse the effects of global supply chains and to develop new methodologies to quantify the role of knowledge flows and service inputs. The aim of RETHINK-GSC is to capture the increasing importance of intangibles in global production and to provide new insights into ongoing and expected changes in global production processes.

The project consists of nine work packages. WP1 and WP2 develop new measures for global supply chains and knowledge flows in global supply chains, while WP3 to WP8 focus more on the analysis of impacts on global supply chains.

- Work package 1: Developing new measures of global supply chains (GSCs)
- Work package 2: New survey data on knowledge flows in GSCs
- Work package 3: Interaction between tangible and intangible GSCs
- Work package 4: Shocks, responses and resilience of GSCs
- Work package 5: GSCs, productivity and technological growth
- Work package 6: GSCs and labour markets
- Work package 7: GSCs and the environment
- Work package 8: Policy scenarios, communication and dissemination
- Work package 9: Scientific coordination and management

In the following, the focus will be put mainly on the Supply Chain Disruption survey (WP2) and its results (WP3-WP8). The Supply Chain Disruption survey is a survey of European enterprises that provides detailed micro data on knowledge flows between firms and their suppliers. The Supply Chain Disruption survey allows the consortium to shed light on the importance of intangibles in input-output linkages at the detailed micro level. The survey was mainly conducted in Austria, Denmark, Germany and Hungary.

The project provides new and innovative methodologies for assessing the development of global supply chains, which generates new knowledge on ongoing and expected changes in GSCs due to shocks. The research, both theoretical and empirical, is conducted mainly at the level of the firm – the unit that ultimately decides on the organisation of international production.

The first round of the Supply Chain Disruption survey was conducted in winter 2023/2024 in Germany, Austria, Hungary, and Denmark and had the aim to analyse disruptions and changes in global value

chains induced by the Covid shock. The second round of the survey was conducted in more EU member states in winter 2024/2025 and focuses mainly on recent changes and challenges in supply chain relationships. In the survey, the focus is put on medium-sized and large firms operating in various manufacturing industries in multiple European countries.

Purchasing managers in Austria, Belgium, Croatia, Denmark, Germany, Hungary, Ireland, Italy, Poland, Portugal, Slovenia and Spain were asked about different aspects of supplier relations. Global supply chains have been facing substantial challenges over the last couple of years: the COVID-19 pandemic, the US-China trade war, the Russian invasion of Ukraine as well as other geopolitical conflicts, and the impacts of climate change. These disruptions have revealed long-standing vulnerabilities in supply chains, especially those associated with concentration and dependence on a single economy or region for the supply of critical products.

As part of RETHINK-GSC's Supply Chain Disruption survey, the participants were asked about various aspects of their production networks, their relationships with strategic suppliers and their adaptation strategies. Among other things, the survey's focus is on changes in production networks in the period from 2019 to today and the responses to unexpected supply bottlenecks.

The project's research involves close collaboration with the project's Advisory Board, which includes representatives from governments, industry federations, trade unions, and international organisations. The Board supports RETHINK-GSC during all phases, from planning to dissemination.

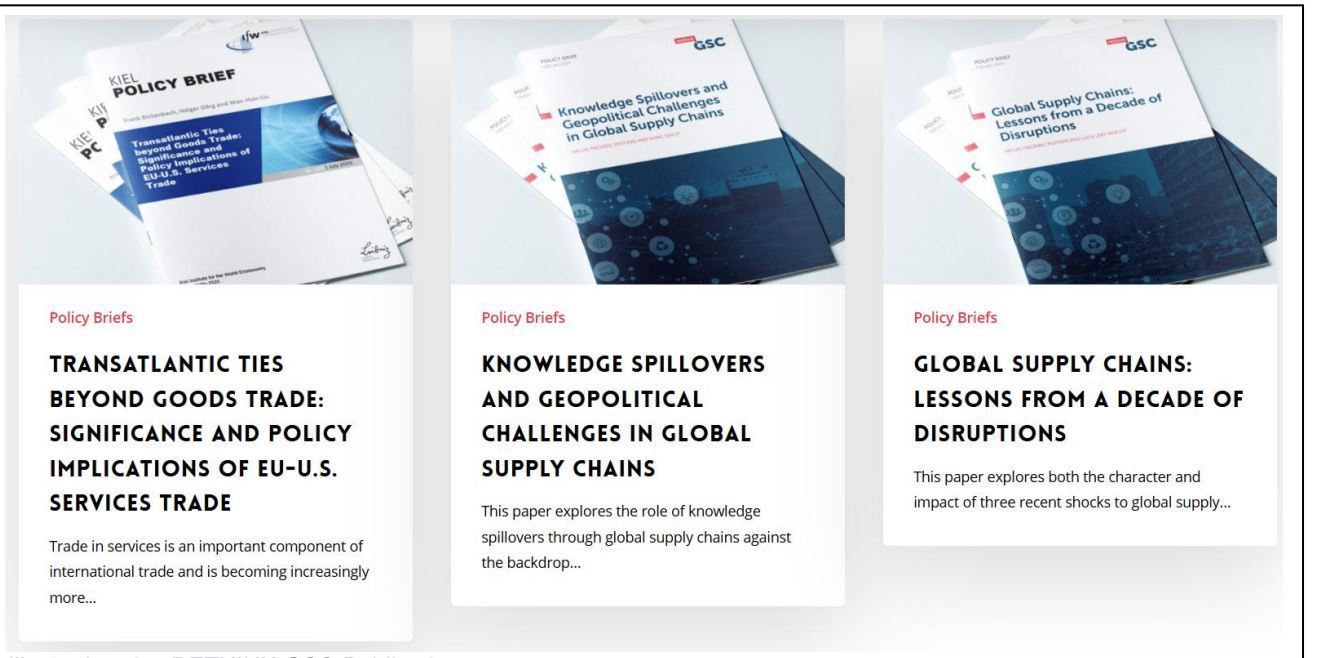

Illustration 35: RETHINK-GSC Publications

One more key project activity generating publicly available and valuable results are the consortium's working papers on several topics surrounding supply chains and the specific corporate research focus that is the project's own. Some of the recent titles of online papers are to be found below:

- Navigating supply chain disruptions: How firms react to low water levels
- Multinationals here and there: Affiliates' response to global crises
- Multinational network, innovation and the growth of employment

- Knowledge, jobs, and unemployment in regions
- Funding structure and university patenting: An analysis of European higher education institutions
- Deriving the Trump tariffs

Impact and added Value

The Supply Chain Disruption survey is used to analyse the consequences of knowledge flows along GSCs at the firm level and to develop appropriate policy responses to changes in GSCs. The main purpose of the survey is to enhance knowledge of the changes currently affecting procurement processes and the answers companies give to overcome supply chain disruptions. In the survey, the consortium focuses on medium-sized and large firms operating in various manufacturing industries in multiple European countries, for which the impact generated is strongest.

Results, Challenges and Outlook

RETHINK-GSC's research shows that firms across Europe respond in varied ways to supply chain shocks, with strong buyer-supplier relationships and innovation driving resilience. The flow of knowledge is closely linked to the movement of goods, but persistent structural gaps remain in Europe.

The consortium's research reveals that firms across Europe most strongly respond to specific supply chain shocks, such as COVID-19 and the Russia-Ukraine war, and in diverse ways. Many have reconfigured their supplier networks. Strong buyer-supplier relationships and joint innovation make firms more likely to adapt and add suppliers locally, though this can also lead to "lock-in" and less geographic diversification.

Knowledge sharing is closely tied to the movement of goods, and innovation helps build resilience, though Europe still faces structural challenges. Firms involved in Important Projects of Common European Interest (IPCEI) tend to keep stable, complex supplier relationships, which presents both opportunities and challenges for policymakers.

One significant challenge encountered during the project implementation, specifically the survey, was survey fatigue, which resulted in a low response rate in some countries. To address this, several mitigation strategies were considered. These included the potential inclusion of additional countries to broaden the respondent pool and the use of targeted communication – such as promoting the results from the first round of the survey – to capture attention and encourage participation. Benchmarking reports were also utilised to further engage stakeholders and demonstrate the value of survey insights.

These challenges cannot seem fully surprising, but the consortium of RETHINK-GSC, within its close-to-businesses approach, mitigated them. As an EUSDR PA 8 Lighthouse, RETHINK-GSC shows a new and insight-driven approach to a topic that challenged companies in the Danube Region and beyond and will most likely continue to do so over the course of the coming years. Gaining knowledge about what companies do, and timing issues, can help to reflect on the effectiveness of measures and to be more informed when it comes to mitigating future challenges and disruptions.

5.3.2 FINANCE

5.3.2.1 KMU.DIGITAL & GREEN

Project Overview and Funding

Currently, this funding program of the Austrian national government (specifically: The Ministry of Labour and Economic Affairs together with the Federal economic chamber) is already in its 4th round which is going on until 2026. The funding instrument is, as its name makes clear (in English: “SME.Digital & Green”) targeted at Austrian SMEs and their green and digital transformation in parallel. It aims at SMEs designing and implementing digitalisation and greening projects and bringing them to market. Market readiness of new solutions, in turn, is an important booster of SME competitiveness and therefore relevant for funding initiatives in the whole Danube Region – which is why KMU.DIGITAL & GREEN was chosen as an EUSDR PA 8 Lighthouse.

The program separates between planning (first step) and implementation (second step) funding. In addition to consultancy funding, there is also implementation funding available. SMEs can gain a total of max. 9.000€ for working on their sustainability and digitalisation projects. Since the start of the programme in 2017, over 32.500 consulting and implementation projects have been supported with a total budget of 32,5 million €.

As the flagship programme of the Federal Ministry for Economy, Energy and Tourism regarding the digital and green transition of the economy, the funding programme creates incentives for SMEs to design and implement digitalisation projects and bring them to market. All in all, the funding programme aims to harness the innovative impact and growth effects of the digital and green transformation, thereby increasing the competitiveness of companies.

Around 7,8 million € were made available for the digitalisation of Austrian SMEs in the sixth round of the programme since 2024. More than 7.500 applications for consulting and implementation projects were submitted by SMEs.

The high number of applications to KMU.DIGITAL & GREEN shows strong demand from SMEs, which is why the programme has been relaunched: The aim is to introduce SMEs to digitalisation as broadly as possible and to support them in their digital and green transformation combined to raise overall transformation effectiveness. The budget for 2024-2026 is 35 million euros.

Application Process and Method

To apply for funding through KMU.DIGITAL & GREEN, SMEs must follow a structured multi-step process. The first mandatory step is a funded consultation, which must be completed and paid out before any implementation funding can be requested. Companies can choose between two types of consultations: a status and potential analysis or a strategic consultation. In any way, SMEs can benefit from status and potential analyses, as well as in-depth strategy consulting.

Once the consultation is complete, the funding application must be submitted via the digital portal, either through kmudigital.at or the AWS Fördermanager. The application requires a fully completed web form, the funding number from the prior consultation, and a detailed breakdown of the planned project costs.

The module implementation supports SMEs in their investments in digitalisation and green transformation projects. As with the module consulting, tools with different focuses can be selected (e.g.

"Business Models and Processes," "E-Commerce, Online Marketing & Social Media," and "IT and Cybersecurity").

Eligible project costs may include new investments – both tangible and intangible – software licenses (pro-rated for the project duration), and services provided by external vendors. Importantly, costs may only be incurred after the application has been submitted, and the project must be completed within a maximum of 12 months.

After the project concludes, applicants must submit a digital proof of use to receive the funding. This includes a factual report, a financial statement, invoices, payment receipts, and, if applicable, annual financial statements. A feedback form must also be completed.

Certain costs and projects are excluded from funding. These include basic IT equipment such as laptops and printers, website updates without functional enhancements, projects conducted outside Austria, non-profit organisations, purely digital companies like fintechs, and ongoing operational costs – except for software licenses used during the project period.

Illustration 36: Logo KMU.DIGITAL & GREEN

Impact and added Value

An evaluation conducted in 2023 confirmed that the programme is an important, independent, and well-received instrument with a clear funding concept. SMEs across all sizes and sectors are using the funding as an opportunity to implement digitalisation and green transformation projects within their companies. Through awareness-raising and targeted support in strategic planning, KMU.DIGITAL & GREEN helps to break down existing barriers and enables SMEs to approach digitalisation and the green transformation in a parallel, needs-oriented manner.

The evaluation recommended the continuation of the programme due to its highly positive impact on the supported companies and its significant importance for the broader digital and green transformation of the Austrian economy, which is dominated by SMEs – and shows that these transformation efforts within local ecosystems can make a difference for a large share of employees because they are working for SMEs. Furthermore, it was suggested that sustainability and digitalisation goals be linked, which is why KMU.DIGITAL & GREEN emerged in the first place.

Main Results and Outcomes

The KMU.DIGITAL & GREEN funding programme makes a significant contribution to advancing the digital and green transformation of SMEs in Austria. SMEs receive low-threshold support at various

stages of digitalisation. In the consulting module, SMEs can benefit from status and potential analyses, as well as in-depth strategy consulting. The implementation module supports SMEs in their investments in the implementation of digitalisation projects.

Furthermore, the programme contributes to Sustainable Development Goals 8 and 9 (Goal 8 "Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all", 8.3 "Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalisation and growth of micro-, small- and medium-sized enterprises, including through access to financial services," as well as Goal 9 "Build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation").

Outlook

Though challenging for any government in times of fiscal limitations on all levels, KMU.DIGITAL & GREEN was extended to another period, and with good reason: The programme is modular, reaches a target group that often is unable to invest by itself and therefore does make a difference. It can be scaled up or transferred to other countries relatively easily, as the funding amount is calculable and could be adjusted for any size of country or entity. As a measurable and pragmatic booster for the competitiveness of especially SME enterprises in the light of the twin transition in Austria, it serves as a potential model for the Danube Region – and therefore, as an EUSDR PA 8 Lighthouse.

5.3.2.2 EMBRACE

Project Overview and Partnership

The EmBRACE funding instrument is coordinated by the Croatian Agency for SMEs, Innovations and Investments (HAMAG-BICRO) and is a small project fund targeted a financing micro and small enterprises (MSEs) in the project area in Croatia, Bosnia & Herzegovina and Montenegro under the cross-border Interreg A program area. It is a pilot project in the sense of being the first in the region that fosters cross-border local cooperation particularly directed at MSEs. Accordingly, the scope of these projects is comparably small, but still impactful as support is being given to the development and adaptation of business models, products, services and processes – with a specific cous on introducing new solutions to the market. The current running time is, in accordance with the Interreg framework, from 2021 to 2027.

This project, deeply and locally rooted in the Danube Region, provides a to be replicated pragmatic approach with a focus on the smallest of enterprise categories, which is still one that accounts for a very considerable share of the workforce allocation in the Danube Region. Therefore, it is an obvious choice as an EUSDR PA 8 Lighthouse increasing competitiveness of enterprises – most specifically directed at the main action of eliminating cross-border barriers and bottlenecks for people and businesses.

Being a lighthouse and a pilot project that represents the first initiative of this kind providing financial support aimed at fostering cross-border cooperation among MSEs through the implementation of small projects, the main objective is to enhance the competitiveness and innovation capacity of MSEs through joint activities, knowledge exchange, and sustainable business development in the cross-border area.

The programme area includes twelve counties in Croatia, the Brčko District and 109 municipalities/cities in Bosnia and Herzegovina, and twelve municipalities in Montenegro.

EmBRACE does not have project partners. The Croatian Agency for SMEs, Innovation and Investments is the sole beneficiary of the Small Project Fund and is fully responsible for the project's implementation.

The target groups of EmBRACE are MSEs operating in selected sectors, as defined by NACE codes, including manufacturing, construction, energy, water and waste management, trade, transport, ICT, tourism services, health and social work, education, arts and culture, and selected business services.

Main Activities and operational Structure

In detail, two main work packages structure the project implementation:

Work Package 1 – Management costs: This work package ensures the successful setup of the Small Project Fund (SPF) scheme and the overall coordination of project implementation including promotion and project visibility. To do so, SPF scheme management and respective promotion and dissemination activities mark the core workload.

Work Package 2 – Small Project Fund: This work package provides direct support to cross-border MSE partnerships, with the objective of providing support to joint small development projects of the MSEs and providing assistance to the MSEs in the process of their project implementation and coping with cross-border business cooperation technicalities as well. To do so, the contracting and implementation of small projects is one core activity.

The funding scheme of EmBRACE works the following way: The project uses standardised costs (SCO) according to the option calculated as up to 40% of eligible direct staff costs and covering all other project activities of the small project fund beneficiary (SPFB) except staff costs. Therefore, the budget of the SPFB consists of two cost categories:

a. staff costs
b. other costs calculated as a flat rate (office and administrative costs, travel and accommodation costs, external expertise and services costs, equipment costs).

During the reporting phase, only staff costs are reported to the First Level Controller (FLC). Activities and achievements of project results and outputs are reported in the activity section / Project Progress Report. The flat rate is directly linked to staff costs and is always calculated based on the final eligible staff costs. If staff costs are not fully validated by the FLC, other costs will be proportionally reduced.

SPFB do not need to prove that the other costs have been incurred and paid or that the flat rate corresponds to reality. Accordingly, it is not necessary to provide documentation on other costs to the FLC or keep it for further controls.

Small Project Reimbursement Structure

The small projects operate on a reimbursement basis, meaning that final recipients must pre-finance their activities, and the funds spent are reimbursed after the submission and evaluation of project progress reports. The reporting process varies depending on the type of small projects as defined in first call for applicants:

- Option 1: SPs that do not exceed 100.000€, i.e. using lump sum will submit a progress report after each of the three milestones and proven results. Milestones for each SP will be defined during the precontracting process. After approval of the report, SPFB will make payment towards FRs.

- Option 2: SPs that exceed 100.000€ will submit progress reports on a four-monthly basis. The SPFB will review the submitted reports about SP implementation progress, ask for completion if needed and accept / approve the submitted report. After approval of the report, SPFB will make payment towards FRs.

The maximum allocated amount of EU funding per small project is 200.000€, regardless of the number of applicants.

Each small project must include at least two final recipients from different countries within the programme area, with at least one partner coming from a European Union member state (in this case necessarily Croatia). During the evaluation of project proposals, partnerships involving all three countries within the programme area receive an additional five points. The maximum number of final recipients per project is four partners.

Impact and added Value

This funding program has multiple positive effects on the border area of Croatia, Bosnia and Herzegovina and Montenegro, since MSE development and better competitiveness will result in more job opportunities and a better socio-economic situation in the area. Support will be given to the development and adaptation of business models, products, services and processes, encouraging the development of local MSEs, with a strong emphasis on the introduction of product or process innovations, the development of pilot actions and new business solutions, while at the same time improving their cross-border business cooperation.

Cross-border cooperation activities are set to directly support the MSEs in the programme area in order to raise their competitiveness, sustainable growth and subsequently job creation. The pilot project will do so by encouraging their cooperation and exchange in entrepreneurial skills, digitisation and technological advancement, the creation of cross-border value chains, exchanging best practices in generating and developing and marketing their products, and especially in competing on the new, cross-border markets. By supporting these MSE enterprises, EmBRACE contributes to stronger cross-border economic integration, more competitiveness, and increased resilience of the regional economy.

Main Results and Outcomes

The EmBRACE project aims to achieve several key results and outcomes measured through programme result indicators and programme output indicators established at the programme level.

Key results and indicators include:

- Solutions taken up or up-scaled by organisations (target: 4): This indicator tracks the number of innovative solutions, other than legal or administrative, developed jointly by supported projects through pilot actions and subsequently adopted or scaled up during the project implementation or within one year after its completion. Uptake refers to the use of solutions developed within the project, while up-scaling means expanding or improving their quality. The adopting organisations may or may not be project partners.
- SMEs introducing product or process innovation (target: 40): This counts the number of small and medium-sized enterprises introducing product or process innovations thanks to project support. Innovations are new or significantly improved products, services, or processes for the supported enterprises, though not necessarily new to the market.
- Enterprises supported and those receiving grants (target: 120 each): These indicators count enterprises, primarily micro and small, benefiting from monetary support through the project.

- Pilot actions developed jointly and implemented (target: 12): Pilot actions are experimental or demonstrative initiatives jointly designed, implemented, and evaluated by partners, aimed at testing novel or adapted solutions in the programme area.
- Jointly developed solutions (target: 8): This measures the number of solutions developed jointly by organisations from at least two participating countries through pilot actions.

The implementation of small projects from the first call has (as of 2025) only just begun. Therefore, the achievement of indicators and the overall impact of the project will only be measurable after the completion of these initial small projects, as well as those to be contracted under future calls within the EmBRACE Small Project Fund. Nevertheless, the high level of interest in the first call and the large number of quality applications received have already demonstrated the strong relevance and demand for this type of support. As a result, the Small Project Fund Beneficiary has decided to increase the originally planned allocation.

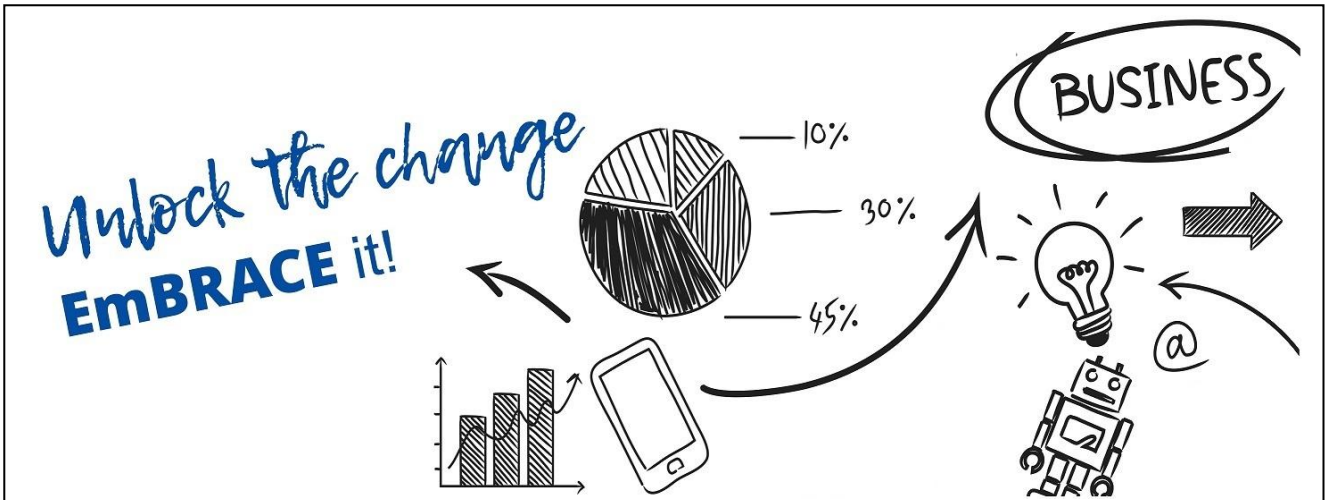

Illustration 37: Unlock the Change

Challenges, Replication Tips and Outlook

Certain administrative challenges related to the management of Small Project Funds had to be considered with implementation, particularly in terms of understanding the regulations of different countries and the need for constant compliance with EU legislation, which requires additional resources and attention.

The model in which real costs are applied (for projects exceeding 100,000€) is being implemented and has been well accepted by the final recipients, with no issues in this regard. However, significantly low interest was realisable from final recipients for the option where the project value was less than 100.000€. The idea for the next call, and possibly interesting for replication efforts, therefore, is to proceed without the option for small projects that do not exceed 100.000€.

For the approach to Small Project Funds in the future, it is recommended to focus on increasing the available funding, which would enable the support of a larger number of high-potential projects. This would not only enhance the overall impact but also contribute to fostering innovation and growth within small businesses.

A strong emphasis should be placed on digitalisation and sustainability, as these are crucial factors for ensuring long-term success and resilience in an ever-evolving market. By aligning the funds with these

priorities, projects that focus on technological advancements, digital transformation, and sustainable practices would be better supported, helping businesses adapt to future challenges.

EmBRACE offers a practical model for small enterprises, which make up a significant portion of the local workforce. As an EUSDR PA 8 Lighthouse initiative, it aims to boost enterprise competitiveness by removing cross-border barriers for people and businesses, which makes it an initiative that would be able to unfold its beneficial characteristics in other parts of the Danube Region – and beyond – as well. The above-mentioned tips for replication can serve as a means to – when setting up cross-border small-scale funding mechanisms in other regions – further increase the productivity of this funding pilot approach.

5.3.2.3 SLOVENE ENTERPRISE FUND VOUCHERS

Project Overview and Partnership

The Slovene Enterprise Fund Voucher program has been in operation since 2019 and will continue to support enterprises in Slovenia until at least 2028. The vouchers are given out by the program to the main focus group of it, SMEs, as small-value incentives directed at enabling a strong and simplified way for SMEs to gain support for targeted transformation projects. Availability is not limited to certain deadlines but given all year. In the current period running from 2023 to 2028, about 21 million € are available for funding. In the preceding period, the total number of SME projects funded amounted to nearly 8.000.

The vouchers are small-value incentives that provide micro, small, and medium-sized enterprises (MSEs and SMEs) with significantly simplified access to co-financing for individual services, which can help companies enhance their competitiveness, competencies, and innovation. The process of obtaining them is, which distinguishes the instrument, comparably easy as they are available throughout the year (until funds are exhausted) and with streamlined and fastened approval procedures.

In this current program period, in line with political priorities of different levels, the program is focused on ESG guidelines and puts the spotlight on green, circular and digitalisation projects. The voucher program has a demand-driven structure, which allows SMEs to apply for support in specific thematic areas relevant to their development needs, with application demands reduced to a possible minimum and based on a first-come, first-served basis. Its pragmatic approach is considered to be well replicable and therefore worthy of being an EUSDR PA 8 Lighthouse.

The Slovene Enterprise Fund has implemented and continues to implement vouchers in cooperation with the Ministry of the Economy, Tourism and Sport, which acts as the intermediary body in the implementation of the programme.

Operational Funding Structure

The most notable aspect of the voucher programme is its demand-driven structure, which allows SMEs to apply for support in specific thematic areas relevant to their development needs.

The main objective of these activities is to offer SMEs fast and simple access to targeted financial support that helps them enhance their competitiveness, build internal capacities, and increase their innovation potential. The programme's structure enables SMEs to select the most appropriate support based on their specific needs.

The major difference when comparing Slovene Enterprise Fund Vouchers with other funding programs is that they are implemented through public calls in which no evaluation methodology or scoring criteria are used. Beneficiaries are selected based on meeting the conditions specified in the public call. Applications are processed on a "first come, first served" basis. While one might criticise that in this way some projects of lesser quality compared to others might be funded, it is forward-thinking in the way that a lot of time and resources are saved on both the sides of the applicants and the funding instrument administration, which overall might as well lead to a more efficient funding instrument implementation.

Illustration 38: SEF Voucher Basics

The following list marks all the different kinds of vouchers of the current period running until 2028 (while not all of them are necessarily available in parallel):

- Voucher for participation in business delegations abroad
- Voucher for quality certificates
- Intellectual property protection voucher
- Life cycle assessment (LCA) voucher
- Voucher for the status transformation of companies
- Ownership transfer voucher
- SME Sustainability Reporting Voucher (ESG)
- Cyber security voucher
- Voucher to boost prototyping in startups

To be eligible, applicants must be micro, small, or medium-sized enterprises organised as limited liability companies, sole proprietorships, or cooperatives, with headquarters located in the Republic of Slovenia. On the day of submitting the application, each company is required to have at least one employee, with the activity holder in sole proprietorships also counting towards this requirement. Furthermore, the enterprise must have no outstanding financial liabilities and must not be in a state of adversity or financial distress, such as undergoing bankruptcy or compulsory settlement proceedings. Firms with registered activities belonging to excluded sectors for their main line of business are also ineligible for support.

Applicants can access free assistance and expert information on individual vouchers or published public calls through the Slovenian Business Points network, which further increases the accessibility of the funds also for smaller companies.

Overall, the roadmap of participating with the Slovene Enterprise Fund Vouchers is as follows:

1. Public call
2. Application preparation
3. Simplified and accessible application submission
4. Application processing at Slovene Enterprise Fund
5. Signing agreement with the Slovene Enterprise Fund
6. Implementation
7. Payment request and evidence
8. Payout

Impact and added Value

The main purpose of the voucher programme is to provide small-scale incentives, enabling SMEs to access support in a significantly simplified way. The aim is to help them strengthen their competitiveness, competencies, and innovativeness in areas based on their specific needs (such as the circular/green economy, digitalisation, internationalisation, intellectual property protection, certification, etc.).

In total, the Fund has supported nearly 8.000 projects through 15 public calls in the 2019–2023 period, with a total amount of approximately 34 million €.

Replication Tips and Outlook

The project implementation did not come with major obstacles, apart from the high demand for certain types of support and the limited financial resources available. Vouchers are already being re-implemented in the 2023–2028 programme period. In the current period, some public calls from the previous cycle are being reopened, while the Slovene Enterprise Fund will also introduce new topics that reflect current market conditions and the needs of SMEs.

Reinvention and progression are important factors that any long-term implementation project should have a clear focus on, which is what the EUSDR PA 8 Lighthouse Slovene Enterprise Fund Vouchers is doing. In a world of administrative and regulatory burden, it shows a low-key approach to the idea of pragmatic, small-scale funding projects that make a short-term difference and therefore, in a way, moves against the current. Precisely because of that, replication is easy, even though scalability might be limited, in larger countries, to the regional level.

5.3.2.4 WESTERN BALKANS GREEN GROWTH ALLIANCE

Project Overview and Funding Background

Funded by the Austrian and Hungarian Ministries of Finance and facilitated by Guidehouse and the Energy Community Secretariat (ECS), the only recently kicked-off initiative Western Balkans Green Growth Alliance is keen to help enterprises throughout the Western Balkans region (Bosnia and Herzegovina, Montenegro, and Serbia) by providing supply chain mapping and sustainable sourcing information, tools and networking. Under the caption of “Empowering sustainable industries”, the aim is to support the region’s transition to a greener economy.

Not only can enterprises check the sustainability level of their enterprise as a service, but they can also receive information about engaging in more strategic, growth-pushing and resilient supply chains. In the end result, the alliance helps private sector companies in the Western Balkans reduce their carbon footprint by adopting more sustainable business practices. Western Balkans Green Growth Alliance is a project of the International Finance Corporation (IFC), a member of the World Bank Group, with the Austrian Ministry of Finance and the Hungarian Ministry of Finance acting as partners. It was kicked off in 2024 and is running, at least for now, until 2026.

As global supply chains come under pressure not only by geopolitical trouble and constraint but also by the imminent need to place them on more sustainable bases, this initiative has its finger on the pulse of the time and therefore is an EUSDR PA 8 Lighthouse. Throughout the Danube Region and especially among the smaller countries, there is demand for cross-national cooperation to make use of these kinds of potentials.

Through strategic partnerships, the alliance aims to create new growth opportunities and establish a Sustainability Resource Hub. It offers a wide range of support, including customised training programs for individual companies and industry groups, expert advice on investment planning, and financial services to facilitate the adoption of green technologies. By participating in the alliance, companies can strengthen their business resilience, integrate sustainability into their operations, and access new opportunities in the green economy.

Main Activities and Method

The initiative aims to support companies across the Western Balkans in their green transition through targeted capacity-building and knowledge-sharing activities. Its primary goal is to serve as a catalyst for the decarbonisation of private sector companies in the region. By promoting the green transition of industries, the initiative seeks to strengthen their competitiveness through the implementation of lighthouse decarbonisation projects, the development of a network of green transition leaders, and the provision of knowledge and resources to guide companies along their green transition journeys.

Targeting mid- and large-sized companies with operations and/or investment plans in the region, the initiative focuses on manufacturing sectors, particularly hard-to-abate industries such as aluminium, steel, chemicals, and cement, as well as agribusiness, food retail, tourism, and property sectors. The alliance seeks to connect corporate leaders in climate action and build a strong network of peers. It introduces participants to cutting-edge sustainability solutions and innovative green technologies, supports the development of bankable decarbonisation and circularity projects, and provides tailored advice on sustainable finance and investment planning. Additionally, it builds knowledge and capacity to help companies seize green growth opportunities.

The Western Balkans Green Growth Alliance focuses on several essential activities aimed at supporting companies in their green transition. Central to the initiative are tailored advisory services on sustainable finance and investment planning, enabling companies to strategically adapt to new environmental requirements. The alliance supports the development of bankable decarbonisation and circularity projects, facilitating access to green finance instruments for enterprises committed to reducing their carbon footprint.

A core element of the project is firm-level training and capacity building, equipping businesses with the necessary skills to integrate sustainability into their operations. To further empower participants, the alliance offers access to a Sustainability Resource Hub, which serves as a comprehensive platform for knowledge and resources related to green growth.

Regional collaboration is fostered through networking and peer-learning events, allowing companies to share best practices and strengthen partnerships. Additionally, the alliance organises workshops dedicated to key sustainability regulations, such as the Carbon Border Adjustment Mechanism (CBAM), ensuring that companies are well-prepared to meet evolving legal and market expectations. Collectively, these activities position the Western Balkans Green Growth Alliance as a catalyst for sustainable transformation and competitiveness in the region.

Illustration 39: Western Balkans Green Growth Alliance

All in all, the alliance applies a multi-stakeholder, firm-level advisory approach that combines awareness improvement and technical assistance including financial structuring on green growth opportunities. Through knowledge events and workshops, the Alliance connects corporate leaders in the Western Balkans to climate action, fosters a strong network of peers, and enhances understanding of green transition strategies while ensuring alignment with EU climate and industrial policy frameworks in the region.

In parallel, the alliance provides bilateral expert advisory services to companies, offering tailored advice on sustainable finance and investment planning. It also supports businesses in translating strategic goals into actionable, company-specific roadmaps and facilitating investments in low-carbon technologies.

Impact and added Value, Results as of now

The alliance is accelerating the decarbonisation of the private sector throughout the Western Balkans by building essential know-how and capacity for the green transition through targeted advisory support. It facilitates the alignment of private sector investments and reporting with key EU sustainability regulations and transition planning requirements. Additionally, the Alliance supports companies in greening their industrial and commercial real estate portfolios, decarbonising their operations, and implementing circular business models.

In its early phase, the alliance has successfully established a regional network of over 100 green transition champions and stakeholders from industry, finance, and government institutions. Through expert panels, peer-to-peer learning, and hands-on workshops, the alliance fosters practical exchange on decarbonisation strategies and builds momentum for scalable, sustainable industrial transformation in the Western Balkans. The full generation of impact and its assessment will have to be awaited still, as the project has only been kicked off in 2024. Still, in the following, some results as of mid-2025 will be listed.

The alliance has successfully launched its regional platform and initiated collaboration with key green transition champions and industrial stakeholders across the Western Balkans. A milestone was the high-profile on-site launch event in Belgrade, Serbia, in January 2025, which brought together more than 100 high-level participants from different stakeholder groups, including companies, chambers of commerce, business associations, financial institutions, think tanks, international organisations, and government representatives. The event featured a series of discussions and panels centred on the green transition, sustainable industrial production, financing strategies, and leadership in advancing decarbonisation efforts. Key topics included the Clean Industrial Deal, innovative technologies for hard-to-abate sectors, corporate-level investment planning, and building sustainable supply chains in the Western Balkans. The launch event received strong regional media coverage, with feature articles in Balkan Green Energy News and other outlets, significantly boosting the alliance's visibility and positioning it as a key platform for industrial decarbonisation in the Western Balkans. The event laid the foundation for a growing network of actors committed to sustainable industrial transformation.

Through expert panels, peer-learning formats, and interactive workshops, the alliance has enabled practical exchange on decarbonisation strategies and investment planning. It has also started to identify green transition lighthouse projects that can serve as replicable models for other companies in the region. Additionally, the second knowledge event under the initiative, focused on the EU CBAM (Carbon Border Adjustment Mechanism), took place in July 2025.

Barriers, Replication Tips and Outlook

Key barriers to the green transition of the industrial sector in the Western Balkans include the significant variation in companies' readiness and progress. While some firms in the Western Balkans region, such as throughout the Danube Region, have already taken initial steps, such as investing in decarbonisation measures or beginning to account for their greenhouse gas emissions, many others remain at an early stage, with little to no awareness of sustainability issues. The project aims to address this gap through tailored peer-to-peer learning sessions and adaptive workshops designed to meet the diverse needs of companies at different stages of the transition.

Another critical barrier is the limited awareness and accessibility of green financing instruments. Many companies are not familiar with available funding opportunities, and there is a general lack of targeted financial products and services that support the industrial decarbonisation process.

A third major barrier is insufficient regulatory awareness. Some companies lack understanding of key policy developments that could significantly impact their operations – such as the EU's Carbon Border Adjustment Mechanism (CBAM) – posing potential risks to their competitiveness and market access.

The alliance responds to these barriers by offering targeted workshops, advisory services, and capacity-building efforts, all tailored to the specific needs and challenges identified across the region. Additionally, a modular approach to project design and the establishment of strong local partnerships have proven to be key success factors, enhancing both scalability and long-term impact.

This approach is wholesome as it does not only offer a certain facet in project development for SMEs but enables them to derive their own approach regarding their transformation and in terms of knowledge transfer and acquisition provides a one-stop shop for their questions. To increase competitiveness, including by building sustainable supply chains, and not lower it in the frame of the green transformation in the Danube Region, interregional initiatives like the Western Balkans Green Growth Alliance are a very promising approach as they combine transformation support with an incentive to extend one's network transnationally – as an EUSDR PA 8 Lighthouse, the alliance is a practical manifestation of this approach.

5.3.2.5 VINNOVATE - INTERREGIONAL FUNDING MECHANISM OF THE VANGUARD INITIATIVE

Project Overview and Partnership

The Vanguard Initiative (VI) has been focused on interregional cooperation with around 40 member regions throughout the European Union for more than ten years. It promotes international project participation and makes the interest of regions in European policymaking visible.

To further deepen the relationship between its member regions and to extend the portfolio of activities, in 2024 the Vanguard Initiative for the first time launched a joint funding mechanism called VInnovate which is targeted at institutions and companies in its member regions. The call combines a wide range of topics and is based on using existing regional funding mechanisms in the regions. Applicants then have to find partners in the other participating regions and therefore make better use of their local funding mechanisms while at the same time fostering internationalisation.

It's pragmatism in using existing funding in a way that supports internationalisation, new supply chains and new contacts that are able to increase competitiveness makes it a project worth considering for future replications – therefore, it was named an EUSDR PA 8 Lighthouse.

The mechanism is implemented through yearly open calls. Following a first pilot call in 2024 (11 regions participating), the VInnovate Call 2025 opened in May 2025 and will support (through the activation and combination of regional funding) international innovations projects (post prototyping level, i.e. TRL5 and beyond), through the provision of grants.

The following eleven member regions, including two Danube Region participations, of the Vanguard Initiative participated in the first VInnovate Call funding round (2024): Lower Austria, Lower Saxony, Norte, Galicia, South NL (Noord Brabant), East NL, North East Romania, Emilia Romagna, Flanders, Wallonia, Wales; and these in the second round in 2025 (eleven in total as well): Lower Austria, Lower Saxony, Norte, Galicia, South NL (Noord Brabant), East NL, North East Romania, Lombardy, Emilia Romagna, Basque Country, Wales.

In general terms, the VInnovate Call 2025 follows the logic of the 'Virtual Common Pot Model', where applicants from participating countries/regions are to be funded according to the rules and decisions of the respective regional/national funding programmes or instruments.

The 2024 call has generated great interest among business innovators; willing to cooperate with EU counterparts. The call enables regions to work together in a joint Smart Specialisation Strategy (S3)-driven endeavour. VInnovate, being integrated to thematic Vanguard Initiative Pilot activities, can offer integrated innovation support to stakeholders, beyond funding only, and prior/post project duration.

Funding Model

The VInnovate mechanism has been developed by the Vanguard Initiative and is currently implemented by eleven participating regions. The strategic objective is to offer appropriate and timely funding opportunities for the implementation of industry-led and strategic interregional projects, therefore fully realising the VI ambition.

Illustration 40: 2025 VInnovate regions, N-E Romania and Lower AT are Danube participants

The mechanism, which is implemented through yearly open calls, has a unique positioning in the interregional funding landscape, combining the key strategic dimensions of holistic innovation support, full regional anchorage and a bottom-up approach. It is implemented through yearly calls. In 2024, the total amount of grants made available was a minimum of four million euros. In 2025, the grants amount made available is 5,5 million euros.

Role within the Vanguard Initiative and the Regions

VInnovate offers users (SMEs in particular) a structural integrated/holistic innovation support (matchmaking + joint programming/designing + funding), building upon VI Pilot activities in particular. VInnovate and the pilots therefore mutually reinforce each other; from facilitating the initiation and design of strategic endeavours, to offering a direct and dedicated funding path. For SMEs, VInnovate can therefore act as a stepping stone towards other international opportunities.

VInnovate is the only mechanism being entirely anchored in regional innovation ecosystems, since it includes an 'S3-based' joint programming, and an 'internationalisation' of regional (ERDF or 'own') resources. For regions, VInnovate can become the tool to internationalise regional funds, in a model guaranteeing impacts in their own ecosystems (with decisions remaining in regional hands). Through joint-programming opportunities, VInnovate will be the tool to address regional needs and ambitions resulting from the S3 priorities on an international dimension.

VInnovate favours a bottom-up approach by offering stakeholders the opportunity to have their actual industrial needs and ambitions at the core of their projects in topics linked to the Vanguard Initiative Pilots (and therefore S3 smart specialisation priorities of region) while contributing to the strategic twin industrial green and digital transitions.

Method and Application Procedure

In the following, the application procedure, exemplified with the 2025 timeline, will be described. Applicants interested in the VInnovate Call follow a clear procedure. First, they can receive support for developing their project ideas and connecting with partners through webinars and an online matchmaking tool. Next, the consortium submits a brief, signed Project Fit Form, for the 2025 version between May 2 and September 15, 2025, outlining the project and partnership.

The VInnovate Secretariat reviews this form within ten days to ensure basic eligibility and notifies applicants by email. If approved, each partner submits a detailed proposal to their respective regional funding agency by October 15, 2025, accompanied by a draft consortium agreement. It is important to note here that the application procedure in this way includes the centralised VInnovate Secretariat at the Vanguard Initiative and the local funding agencies (e. g. ministries) in parallel, reflecting that the call combines the latter's resources in an interregional fashion.

The regional agencies then review the proposals, and a project is only funded if all regions involved give their approval. Once the evaluation is successful, partners finalise and sign the consortium agreement, followed by contracts with their agencies. Approved projects must begin within three months and comply with national or regional reporting requirements. Importantly, funding amounts vary by participating region.

Impact and added Value

As none of the VInnovate-funded projects have been concluded so far, this section can only be a first assessment. Looking at the Call 2024 though, relying upon combinations, at single project level, of private and public regional funding (ERDF and own sources) and cooperation among distinct types of actors (24 SMEs, with other companies or research/technology centres and universities), the 2024 Call's twelve selected projects are at the moment contributing to the twin transition and enable the deployment of several new approaches.

A few of the project examples are mentioned below:

- Innovative, refined design & manufacturing process for advanced control and monitoring systems of tidal mill blades (cooperation among 3 SMEs and 2 technology centres)
- Secure Digital Assets Platform for Additive Manufacturing (cooperation among 2 SMEs and 1 tech centre)
- Innovative Photonic Integrated Circuit for personal health management (cooperation among 1 SME, 1 Large Company and 1 tech centre)
- Additive Manufacturing (AM) techniques that leverage recycled materials, with a particular focus on recycled thermoplastics and short fibres (cooperation among 3 SMEs and 1 tech centre)

These projects represent the thematic priorities of the first VInnovate call and show the scope of innovation that receives funding under its umbrella.

Replication Ideas and Outlook

VInnovate is an experimental, but very promising element in the quest to transition towards a more sustainable, digitalised and forward-thinking network of regional economies in Europe. It combines the knowledge of regions about their transformation needs, assets and economic structures with a European approach that incentivises SMEs to cooperate beyond borders – specifically here focusing on the involvement of two Danube Region participants – with and beyond the Danube Region.

Replication is doable without obvious bottlenecks, and VInnovate itself has the potential to be working with more funding participating regions. As an EUDSR PA 8 Lighthouse, it provides an example of a funding instrument that tries to combine the best of both worlds (a decentral and centralised one) and contributes to not only more sustainability and future readiness, but also European networking of SMEs and possible new value chains that can enable enterprises to increase their competitiveness.

6. POLICY RECOMMENDATIONS

Looking at the catalogue of lighthouse projects and initiatives presented, a number of first conclusions can be drawn with regard to common schemes, common benefits and the resulting common factors that make these initiatives successful. There are certain issues that policymakers should consider as they allow and incentivise market actors, regional public institutions and groups of stakeholders to develop beneficial solutions for the challenges at hand. A list of them is condensed below.

- **Design funding instruments in an open, but targeted way**
  Funding instruments should be designed in a way that embraces ideas – in a most pragmatic way, and also for smaller-scale projects. Reduction to pre-tested impact reliability can cause a significant and harmful limitation that may provide productivity and relative success of funded endeavours but may at the same time limit groundbreaking innovation. Openness to new approaches is essential not only when evaluating proposals, but also when designing a funding instrument and choosing how to evaluate.
- **Still, design calls for proposals in a way that includes future funding perspectives**
  Nevertheless, including requirements in calls that are aimed at securing that project applicants include work in their project on the follow-up of developed solutions and the financing of those on the public and especially on the private side is essential. Uptake of innovative solutions is crucial, and capital too often is the limiting factor.
- **Actively enable innovation**
  Innovation should be enabled. Many of the projects mark, for the region they were implemented in, strategies that are of pioneering value. In that sense, they can be considered sandboxes – only that most of the time, they did not have any simplifying context elements that would classify them as a regulatory sandbox. Regulatory sandboxes, as pushed by the European Commission on several levels, would allow generating innovation faster, identifying bottlenecks more precisely, and enable SMEs and start-ups to use test-before-invest solutions in order to prove the validity of their investment strategies. Particularly with regard to the topics which the lighthouse projects in the area of AI showed, the transformation leeway in the Danube Region is long, and cooperation with regulatory sandboxes therefore imperative.
- **EU Danube Region Strategy: Keep looking out for future cross-sectoral/technology fields**
  For the EUSDR strategy, it can be stated that the challenges innovators and enterprises in the Danube Region face of course are not new and have been identified before. However, with this study, certain patterns of innovation hubs could be observed – for example, in AI development, there could be strengths observed in the traditionally more advanced parts of the EUSDR Danube Region, whereas regarding circular economy, many shining examples, more than elaborated on in this study, could be observed towards the Southeastern parts of the region. It is integral for the benefit of enterprises to enable cross-sectoral matchmaking of enterprises, authorities and other kinds of providers. Other sources show the future relevance of combining Circular Economy and AI within the concept of Industry 5.0, which further asserts this point.
- **Foster technology transfer and capacity-building**
  Building on these previous insights, the next recommendation emerges: the need to foster regional knowledge transfer and capacity-building networks. To maximise the impact of lighthouse projects and ensure their benefits are scalable and replicable, policymakers should establish and support structured mechanisms for knowledge exchange. This includes regional innovation hubs and competence centres that act as intermediaries between successful

previously implemented projects and emerging initiatives, capacity-building programs for local authorities and SMEs, peer-learning platforms and cross-border mentoring schemes, and digital repositories documenting project outcomes and lessons learned. Such efforts would help bridge the gap between innovation leaders and lagging regions, reduce duplication of efforts, and accelerate the uptake of transformative solutions – especially in areas like AI and Circular Economy where regional disparities are evident. Necessarily, this involves multiple political and organisational levels within the Danube Region actively engaging with *all* quadruple helix actors throughout the entire process.

- **Strengthen transnational and cross-sectoral collaboration platforms**
  The study highlights that some of the most resilient and innovative lighthouse projects emerged from strong transnational and cross-sectoral partnerships. Policymakers should invest in and facilitate platforms that enable enterprises, research institutions, public authorities, and civil society from different countries and sectors to collaborate on shared challenges. This includes supporting Danube Region-wide cross-learning, matchmaking events, digital collaboration tools, and joint project development workshops, especially for SMEs and emerging innovation hubs – just like it was part of many of the projects presented in this study.
- **Promote demand-driven and user-centric support mechanisms**
  Many successful projects in the catalogue of this study were characterised by their responsiveness to the real, day-to-day practical needs of enterprises and communities. Policies should prioritise support instruments that are demand-driven, allowing for bottom-up identification of challenges and co-creation of solutions, especially in the Danube Region's more local levels. This includes flexible funding calls (as mentioned above, but it does not only refer to financial funding alone), open consultation processes, and the integration of user feedback into policy and program design and evaluation.
- **Facilitate knowledge transfer and replication of best practices**
  The replicability and scalability of lighthouse projects are central to their impact. Policymakers should establish structured mechanisms for knowledge transfer, such as open-access repositories of project methodologies, toolkits, and legal studies, as well as peer-learning networks and study visits. This study is an exemplary approach for that directed to the Danube Region. Special attention should be paid to supporting lagging parts of the region in adapting proven models to their local context.
- **Invest in skill development for digital and green skills**
  A recurring barrier identified in the study is the lack of digital and green skills among Danube Region SMEs, local administrations, and communities. Policy should support targeted capacity-building programs, including vocational training, digital literacy initiatives, and sector-specific upskilling, to ensure that all actors can participate in and benefit from innovation-driven transformation.
- **Encourage the development of regional innovation hubs and clusters**
  The emergence of and integration into regional innovation hubs and clusters – especially in bioeconomy, circular economy, and digitalisation – was a key success factor for a number of projects. Policymakers should incentivise the creation and strengthening of such hubs throughout the Danube Region, ensuring they are inclusive, multi-actor, and connected to both local needs and international networks. Support should include funding, infrastructure, and facilitation of stakeholder engagement.

- **Simplify access to funding and reduce administrative burdens**
  Several projects noted that simplified, low-threshold funding instruments (such as voucher schemes and small project funds) were highly effective in mobilising SMEs and fostering innovation. Strategists and public officials in the Danube Region should streamline application and reporting procedures, provide clear guidance, and ensure that funding is accessible to a wide range of actors, including micro and small enterprises. Although this is a sufficiently discussed multi-level problem at the moment, it needs to be mentioned.
- **Integrate monitoring, evaluation, and adaptive learning**
  The study's methodology emphasises iterative feedback and continuous improvement. Policy frameworks should require robust monitoring and evaluation mechanisms, including stakeholder feedback loops, to ensure that programs remain relevant and effective. Adaptive learning should be built into both policy and project cycles, allowing for timely adjustments based on real-world outcomes.
- **Support the creation of open data and transparency initiatives**
  Projects like ASCII (Supply Chain Intelligence Institute Austria) demonstrate the value of open, data-driven approaches to complex challenges and allowing the general public to profit from scientific insights. Danube Region policymakers should promote the development of inter-operable, open data platforms, transparency tools, and public reporting standards to empower enterprises, researchers, and the public with actionable information.
- **Learn and understand on-site**
  Even though the largest share of information for this study was gained by desk research and email exchanges, personal interactions with the lighthouse representatives proved most fruitful. In preparation of any policy or initiative, exchange with those most experienced is and remains crucial – even in an almost fully digitalised world.

All in all, the prioritisation of these recommendations depends on the recipient – European policymakers will have a different take as opposed to local ones, private actors or business support organisations. What these recommendations should have in common is that they, if implemented, support the competitiveness of enterprises in the Danube Region. This is an endeavour including many kinds of stakeholders and screws to be turned – single actions might, even though intended the right way, not reach their desired effect. All involved must collaborate on a vertical and horizontal line to make it easier to innovate, invest, grow – and still move the economy in the Danube Region towards a climate-neutral and environmentally sustainable basis.

7. FUTURE TRENDS

Globalisation is seen by many to be a potentially retreating or at least troubled phenomenon – speaking as of the turbulent year of 2025, even more so. However, the conclusion that transnational cooperation of enterprises, universities, public authorities and all other stakeholders should somehow be reduced in order to be less dependent on external factors would be profoundly wrong.

On the contrary, some of the most vibrant examples of the lighthouse projects in the Danube Region show us that in seeking for cooperation partners, resilience can be laid a basis for – but not by cutting ties with other actors. This marks a future trend that is part of the largest one of all: Increasing global competition and, not to mention, an overall situation that is branded by a race on the higher scale between powers, companies and countries that is less focused on beneficial cooperation and more on gaining strength in own – and only own – interests. In these times, efficient use of

technology, effective clustering and cooperation as well as targeted support for private actors by the public side, especially on the regional level, become ever more essential.

Focusing strength and capacity on the regional and interregional level on areas, industries and technologies of the future is clearly the way forward in the Danube Region. Artificial Intelligence and all industries and adoptions surrounding it is clearly an example for that, as is the overall area of circular- and bioeconomy, which can be thought of as providing benefits not only in terms of saving climate and environment but also creating jobs, supply chains and new, added value. Finally, all these endeavours, especially on the private and MSE/SME-based side, need pragmatic financing options that consider the realistic situations and capabilities that potential mobilisers of private capital find themselves in. This study has presented a few of a long list of examples for such initiatives.

The analysis of lighthouse projects reveals a clear shift toward more integrated, collaborative, and adaptive innovation systems. Funding instruments should evolve to become open yet targeted, lowering entry barriers for SMEs while embedding pathways from pilot to market uptake through commercialisation plans, blended finance, and innovation procurement. Regulatory sandboxes and test-before-invest infrastructures – linked across borders and aligned with EU frameworks – are one cornerstone in order to accelerate responsible experimentation, particularly in AI, data, and energy.

A major thematic trend is the convergence of AI and Circular Economy within Industry 5.0, leveraging regional strengths and enabling applications such as resource efficiency, digital product passports, and supply-chain transparency. To scale these solutions, institutionalised knowledge transfer will be essential, supported by competence centres, peer-learning networks, and open repositories that allow replication and adaptation across diverse contexts and diverging means and needs.

Regarding AI in the human-centric context specifically, across the ten lighthouses in this thematic field, digitalisation is being leveraged to create human-centred, data-driven and interoperable solutions. Three converging trends are visible: (1) the shift from technology-first pilots to ecosystem and talent programmes (CroAI, CITADELS); (2) embedding AI for predictive, resilient operations in industry and infrastructure (OPTIMUM, EuProGigant, Operator 4.0); and (3) using living labs and VR/AI interfaces to accelerate adoption and access in safety, health and agriculture (VR Police Training, VIRADIA, DEMO FARMS, DAP). Circular DigiBuild, for example, highlights the power of open tools and identifiers to connect upstream material circularity with downstream smart operation – a template that other sectors can adopt through standards and data spaces. Common barriers – interoperability, data access, cultural inertia, fragmented governance – are best mitigated via trust-building, open standards, and co-created roadmaps that align incentives across stakeholders.

Overall, collaboration should and will increasingly operate on a multi-actor, transnational and cross-sector basis, with challenge-driven calls, living labs, and user-centric design ensuring relevance and adoption. Human capital development – especially in digital and green skills – will be a critical enabler, alongside the creation of regional innovation hubs connected to international networks. Simplified access to funding, streamlined administration, and adaptive program management will further enhance participation and impact in terms of public support for private initiatives, big or small.

Finally, open data and interoperable data spaces will underpin transparency, research, and new AI-driven, trustworthy services, while hybrid engagement models should combine digital efficiency with the trust-building power of on-site interaction. Together, these trends point to an

innovation agenda that is collaborative, mission-oriented, and inclusive – designed and ready to use in order to incentivise technology uptake, strengthen competitiveness and accelerate the transition to a vibrant, yet ever more climate-neutral, just and sustainable economy in the Danube Region.

8. CONCLUSION

This study set out to make visible the breadth and depth of innovation across the Danube Region by identifying lighthouse projects that visibly and understandably strengthen the competitiveness of enterprises. It applied a simple but targeted methodology that combined project self-assessments with independent scoring against five criteria – innovation and differentiation; replicability and scalability; measurable impact; sustainability (in several dimensions); and alignment with EUSDR PA 8 goals – culminating in a catalogue of 30 Danube Lighthouses across the thematic fields of Green Tech/Circular Economy & Bioeconomy, Digitalisation/AI/Metaverse and Virtual Worlds, and Supply Chains & Finance. In total, more than 160 candidate projects, initiatives and best practices were researched and examined to ensure quality, geographic balance, and contemporary relevance.

Across this information basis, a consistent picture emerges: the Danube Region possesses a vibrant, though uneven, innovation landscape that is strongest when public enablers, intermediaries and private actors work in close collaboration, coordination and alignment. The most effective initiatives lower entry barriers for SMEs, offer clear-to-navigate support, and build explicit bridges from early pilots to sustained market uptake. Voucher schemes, small-project funds, dual education formats, and pragmatic acceleration services have proven especially beneficial for first-time innovators and micro enterprises, while demand-side tools such as innovation procurement and challenge-led calls help create realistic pathways to adoption.

As a first cross-cutting conclusion, the lighthouse examples show that openness and targeting are not in tension but mutually reinforcing. Instruments that welcome experimentation – rolling calls, lump-sum or voucher-style grants, and modular technical assistance – achieve the best participation and diversity of solutions when coupled with clear thematic focus, outcome metrics, and credible plans for follow-up finance. Conversely, narrow ex-ante proof requirements risk optimising for incremental improvements at the expense of breakthrough innovation and scale.

A second cross-cutting conclusion concerns "scale by design." Successful projects, and this does not regard any specific field of the lighthouses presented here, embed downstream adoption from day one: they require commercialisation and financing strategies, build consortia around demand, and leverage blended finance to move from prototype to procurement – even if projects themselves only coordinate such processes in an overarching way. Where this continuum exists – test-before-invest infrastructures, regulatory sandboxes, competence centres, and replication playbooks – the "pilot graveyard" shrinks markedly and innovations transition faster into supply chains and public services. This applies especially to circular economy, where there is a never-ending list of potentials and scales of usage on private and public levels.

Third, the Danube Region's comparative edge will come from the convergence of digital and green capabilities, particularly the coupling of AI with Circular Economy under the Industry 5.0 paradigm, as stressed by several EU strategy initiatives. The portfolio points to an emerging pattern: traditionally more advanced parts of the region concentrate AI capacity, while other areas furnish strong circular economy exemplars. Cross-regional matchmaking that fuses these strengths – e.g., AI-enabled resource efficiency, digital product passports, traceability and transparency in supply

chains – promises impact and might be pursued as a strategic priority for EUSDR PA 8. Regarding AI as the most central future level playing field, it must be added that investment in the research and roll-out of AI adaptations is not only too slow in the Danube Region, but, in global comparison, in Europe generally.

Fourth, institutionalised knowledge transfer is crucial. The initiatives that travelled furthest beyond their original context do not rely on ad-hoc dissemination; they created competence hubs, peer-learning networks, legal and technical toolkits, and open repositories of methods and outcomes that are partly available for others. These structures reduce duplication, shorten learning curves, and help those that are lagging adapt proven models to local constraints. Strengthening such “scale-out” infrastructure at Danube Region level will accelerate convergence across the macro-region.

Fifth, people and skills remain the binding constraint. Many SMEs and local administrations still lack the digital and green competencies required to absorb innovation. Dual and work-integrated programmes, micro-credentials, modular upskilling for public procurement officers, and targeted training for cluster managers repeatedly emerge as game changers. Future program cycles should treat skill formation not as an adjunct but as an equal priority alongside technology and infrastructure.

Sixth, data openness and interoperability multiply return. Where projects created open datasets, indices, or sectoral data spaces – and complemented them with clear governance and FAIR-aligned standards – secondary use flourished, research intensified, and policy targeting improved. This applies as much to supply-chain intelligence as to circular construction, agriculture, and digital health. The Danube Region strategy can increase regional dividends by promoting shared schemas, reference architectures (which this study can be an element of), and public dashboards for monitoring and evaluation.

Seventh, administrative simplicity can be considered competitiveness policy. Low-threshold access, first-come/first-served micro-supports, standardised templates, and clear guidance significantly broadened participation and sped up project delivery. Coupling these with robust, iterative monitoring – and the willingness to adapt within project and initiative running timeframes – proved more impactful than elaborate ex-ante gatekeeping. An “evaluate as you go” culture might be mainstreamed in future instruments and project designs.

Eighth, transnational and cross-sector collaboration is now the default. The strongest lighthouses (even if local) mobilised multi-actor, cross-border associations and coalitions that reached minimum viable scale for testing and adoption, often leveraging Digital Innovation Hubs, cluster-to-cluster platforms, and living labs. Beyond grantmaking, one should continue to invest in orchestration capacity – matchmaking, joint workshops, and sandbox mutual-recognition – so that collaboration becomes even more of a routine.

Limitations and Lessons for Future Updates

Two methodological boundaries of this study call for some more emphasis. First, the catalogue of lighthouses reflects active participation: non-respondents, including potentially excellent initiatives, could not be assessed with equal depth, introducing a participation bias. On the other hand, only this way forward could ensure excellence in the information basis for the projects described in this document. Second, the portfolio captures a time-bound snapshot (projects running since 2023 and no experiences past 2025), which emphasises contemporary information and prioritisation over historical continuity. These choices were deliberate – to favour present transferability and relevance – but they

argue for rolling updates and ideas for additions, including future impact checks, especially for projects described here that had a running time (so far) of less than a year.

A shared Mandate going forward

The Danube Region's innovation capacity does not hinge on discovering isolated "unicorn" projects; it depends on making it easier for many actors to innovate, adopt, and grow. That, in turn, requires vertical and horizontal alignment: European, national, and regional policies must converge on open-but-targeted funding, clear pathways, enabling regulation, and investment in people, data, and collaboration platforms. The lighthouses in this study show that when these pieces come together – often in very modest, but highly practical instruments and contexts – the region can translate experimentation into competitiveness at pace.

In conclusion, the study affirms that the Danube Region is innovation-ready: it has the talent, institutional scaffolding, and a growing stock of replicable models. The task now is to mainstream what works – to institutionalise replication, use these results, kick-off testbeds and sandboxes, align finance with uptake, and keep administrative doors wide open for SMEs. If stakeholders sustain this collaborative, mission-oriented approach, the Danube Region can accelerate its twin transition, build more resilient value chains, and turn its diversity into a lasting competitive advantage – delivering growth that is both climate-neutral and widely shared.