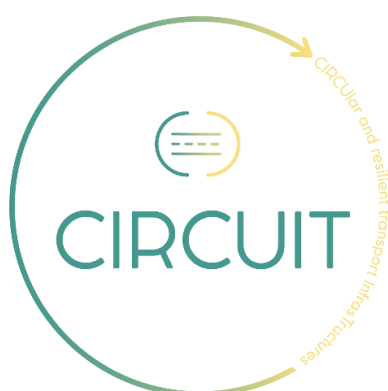


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# - CIRCUIT -

Holistic approach to foster CIRCULAR and resilient transport InfraStructures and support the deployment of Green and Innovation Public Procurement and innovative engineering practices



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## – Deliverable 6.5–

### ***CIRCUIT Dissemination & Exploitation Plan 1<sup>st</sup> Update***

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Project reference no.	101104283
Project Acronym	CIRCUIT
Project Full title	Holistic approach to foster CIRCULAR and resilient transport InfraStructures and support the deployment of Green and Innovation Public Procurement and innovative engineering practices
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4	ANAS SPA – ANAS	Italy
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15	Ministerio de Transportes, Movilidad y Agenda Urbana – MITMA	Spain
16	INGEVITY HOLDINGS SRL – NGVT	Belgium
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## Executive Summary

To address the growing global demand for reducing greenhouse gas emissions, boosting energy efficiency, implementing Circular Economy principles, and accelerating clean energy adoption due to climate change, road infrastructure must transition to sustainability. Enhanced designs and upgrades are now essential. Although various engineering software tools support these processes, limited open-source tools hinder their deployment, especially for measuring circularity, sustainability, and resilience and the traditional design tools libraries do not include secondary raw materials, biomaterials or eco-designed construction elements. The CIRCUIT project aims to develop a holistic approach, supported by digital solutions and guidelines to foster the introduction of innovative engineering practices in the whole construction supply/value chain, focusing on four key pillars: Digitalization, Recycling, Reuse, and Energy.

The project technological innovations will be tested and validated in five demonstration pilots in EU (Croatia, Spain, The Netherlands, Slovenia and Italy) covering road, embankment, tunnel, and bridge infrastructure. These solutions will align with circular economy principles, reducing environmental impact and facilitating the shift to smart, resilient transport systems.

**Communication, dissemination and exploitation are core activities in the CIRCUIT project to ensure that the knowledge and the results generated in the project are communicated to the relevant stakeholders in a clear, consistent, and effective manner.**

While dissemination activities primarily aim at transferring knowledge and information to stakeholders, communication activities are directed toward public outreach and raising awareness. In contrast, exploitation endeavours to apply the results in additional research activities beyond the scope of the current action, as well as in the development, creation, and marketing of products or processes, provision of services, and standardization activities.

**This report (D6.5) provides a comprehensive overview of the dissemination and communication activities conducted during the first 18 months of the CIRCUIT project. It includes a detailed listing of the communication activities and methods used, along with their impact on various target groups and the progress made in relation to the major Key Performance Indicators (KPIs) outlined in D6.2. Additionally, the report presents the exploitation strategy, including initial discussions on the key exploitable results and their associated exploitation pathways.**

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# 1 Introduction

## 1.1 Purpose of the document

This report (D6.5) provides a comprehensive overview of the dissemination and communication activities conducted during the first 18 months of the CIRCUIT project, from May 2023 until October 2024 as well as the achievements, the impact of the implemented actions and a high level overview of future actions. It includes a detailed listing of the communication activities and methods used, along with their impact on various target groups and the progress made in relation to the major Key Performance Indicators (KPIs) outlined in D6.2. Additionally, the report presents the exploitation strategy, including initial discussions on the Key Exploitable Results (KERs) and their associated exploitation pathways.

Taking into consideration that until M18, the project was in the initial stage, the goal was to predominately inform and explain the objectives of the project and the pilots. Therefore, this report presents the implemented actions, the means that have been utilised to engage with different target groups and their impact as well as the upcoming plans which are aligned with the 2nd stage of the project – the implementation and deployment of pilots phase.

To achieve its goals, CIRCUIT deployed various means of communication (offline and online) such as website, social media, blog posts, partners' participation and presentations in workshops and conferences. As mentioned in the executive summary, these activities need be evaluated using the defined KPIs and find potential ways of improvement.

With respect to dissemination, the following activities have been implemented:

- Participation to 8 national and international events

As far as communication, the achieved values are as follows:

- 137 on LinkedIn and 109 followers on X
- 1 general roll-up, 1 scientific poster designed for the ZAG Open Day, 2 infographics linked with the project's pilots
- 3 press release
- 1 project newsletter
- 1 video on the Slovenian pilot
- Various communication campaigns linked with the pilot's updates and technical meetings

### 1.1.1 Scope of the document

This document will cover the following elements:

- Summary of the methods and tools of shared information and their strategies
- Present all the activities performed in the first 18 months of the project
- Analyse the impact of the activities and determine areas of improvement, if needed
- Preliminary Exploitation strategy and plan
- Provide an overview of the type of communication, dissemination and exploitation activities for the upcoming months



## 2 Communication and dissemination strategy

### 2.1 A summary

The dissemination and communication strategy of CIRCUIT aims to:

- Reach out and engage with the project's target groups (public Authorities, Construction companies, designers, architects, civil engineers, scientific community and civil society) addressing their needs
- Effectively communicate the project's objectives and the future technological solutions which will be tested in the five pilots;
- Create brand guidelines and develop a distinctive and broadly recognised visual identity
- Raise awareness on sensitive environmental topics such as circular transport infrastructure, environmental impact, reuse, save energy and reduce pollution at every step, from construction to maintenance and even dismantling.

To achieve these goals, the project uses a wide range of dissemination tools and channels.

During this first period, the dissemination and communication strategy has been focused on supporting and effectively communicating the following specific objectives (SOs):

- Implement and validate the CIRCUIT approach in five pilot case sites.
- Transfer knowledge and engage with relevant stakeholders, authorities, and end-users, emphasizing the benefits of integrated circular principles in managing transport infrastructure for diverse user groups.
- Evaluate and implement effective exploitation strategies.


These objectives were reached by using different dissemination means and channels which will be analysed in the next sections.


In the second phase of the project implementation, communication and dissemination efforts transition to a more mature phase, with a focus on disseminating the significant research results and technological solutions developed by the partners. During this phase, the dissemination efforts as well as the collaboration and clustering activities will be enhanced aiming to maximise the project's outreach capacities and impact in the respective target audiences and above.

### 2.2 Key messages

In the first period of the project implementation, communication activities focused on creating awareness of the project, building a core stakeholder community, and drawing in stakeholders from the broader community.

Some examples of key messages shared on CIRCUIT social media can be found below.

 **CIRCUIT provides access to cutting-edge digital technologies and circular solutions that will elevate engineering and construction practices.** These innovations will enhance the entire transport infrastructure value chain by:

-  Reducing environmental impact through sustainable materials and processes.
-  Improving project efficiency and resource management
-  Driving innovation in the adoption of circular design principles.

### CIRCUIT: Shaping the Future of Resilient, Smarter Transport in Europe!

Through sustainability, circularity, and digital innovation, we're transforming transport infrastructure and reducing environmental impact.

Check out our  infographic to learn more!

**Each pilot is making strides toward more resilient, circular, and sustainable systems, aligned with our four strategic pillars.**

*This is just the beginning!* 

Swipe through the carousel to explore how our five pilot sites are paving the way for the future of transport infrastructure:

- ◆ **Croatia:** A focus on enhancing safety and digitalisation of highway infrastructure.
- ◆ **Slovenia:** Reusing materials to reduce environmental impact.
- ◆ **Spain:** Circular and greener asphalt technologies are at the heart of this pilot.
- ◆ **Netherlands:** Innovative soil stabilization methods to prevent erosion.
- ◆ **Italy:** Cutting-edge energy-saving solutions.

In the second phase of the CIRCUIT project, dissemination activities will center on effectively communicating the project's key outcomes to relevant stakeholders.

#### **Key Focus Areas include:**

##### **1. Holistic Framework and GPP:**

Dissemination will emphasize the holistic framework and KPIs developed to foster circularity and resilience (WP1). This includes insights into the primary barriers to circular management and green public procurement in the infrastructure sector (WP4).

##### **2. Innovative Tools (WP2):**

The promotion will highlight groundbreaking tools developed in the project, such as:

- The **Circularity Analytics Tool**
- The **Digital Product Passport**
- The **Supply-Chain Matchmaking Tool**.

##### **3. Pilot Project deployment and innovations (WP3 and WP5):**

The dissemination strategy will showcase the innovative solutions deployed across five pilot projects, including solutions for bridge construction, geotechnical structures, asphalt concrete mixtures, and tunnel energy management systems. These solutions will be highlighted through CIRCUIT's digital platforms and events, tailored to engage specific target groups effectively.

##### **4. Stakeholder Engagement:**

- **Public Authorities:** Continued outreach with results from WP4 and WP6, focusing on enhancing green public procurement.
- **General Public:** Promotion of project messages aligned with International Days, local actions/events, environmental challenges, and expert interviews.

Some examples of messages can be found in the table below.

**Table 5** Key messages to disseminate CIRCUIT results to stakeholders (M18 onwards)

Title	Title
<b>Public Authorities</b>	<p><b>The CIRCUIT project will equip public authorities with innovative strategies to modernize the construction and management of transportation infrastructure.</b> Results will help:</p> <ul style="list-style-type: none"> <li>• Improve the understanding of zero- and low-emission transport infrastructure.</li> <li>• Develop specific guidelines to enhance Green Public Procurement (GPP) in the infrastructure sector.</li> <li>• Optimize the long-term management of transport infrastructure, ensuring sustainability and compliance with environmental standards.</li> </ul>
<b>Construction companies, designers, architects, civil engineers</b>	<p><b>CIRCUIT provides access to cutting-edge digital technologies and circular solutions that will elevate engineering and construction practices.</b> These innovations will enhance the entire transport infrastructure value chain by:</p> <ul style="list-style-type: none"> <li>• Reducing environmental impact through sustainable materials and processes.</li> <li>• Improving project efficiency and resource management.</li> <li>• Driving innovation in the adoption of circular design principles.</li> </ul>
<b>Scientific community</b>	<p><b>The CIRCUIT project generates valuable knowledge in the field of sustainable infrastructure, offering researchers and scientists:</b></p> <ul style="list-style-type: none"> <li>• Insights into advanced circular design and material reuse for transport systems.</li> <li>• Opportunities to explore new engineering methods that reduce carbon footprints.</li> <li>• Data and case studies on the environmental and societal impacts of sustainable infrastructure.</li> </ul>
<b>Citizens and multipliers</b>	<p><b>CIRCUIT is transforming the way transportation infrastructure is built and managed by prioritizing sustainability, energy efficiency, and circularity.</b> This project will help citizens:</p> <ul style="list-style-type: none"> <li>• Understand the environmental and circularity impact of transport infrastructure.</li> <li>• Learn about innovative solutions being implemented to create greener, more sustainable urban spaces.</li> <li>• Recognize the benefits of reduced pollution, energy savings, and better living conditions in their communities.</li> </ul>

## 2.3 Visual identity

In the first 18 months of the project, CIRCUIT has developed a consistent visual identity to ensure easy recognition. The initial six months witnessed the creation of the first set of dissemination and communication materials, including the CIRCUIT project logo, brand elements, and the project's PowerPoint template. This standardisation aims to harmonise all communication and dissemination actions among project partners, as outlined in deliverable D6.2.

Furthermore, CIRCUIT has designed and developed additional dissemination materials, such as a deliverable template, infographics, visuals, videos, and a brochure. Screenshots of these materials were also included in D6.2. The flyers and roll-ups were distributed by partners at various events, such as the ZAG Open Day in Ljubljana and the Connecting Europe Days 2024 conference informing attendees about the project's objectives, pilot sites, and major innovations.

## 2.4 KPIs – where we stand

Table 6 KPIs template – progress

Communication/ dissemination measures	Project KPIs	Where we stand (M18)
Website	+1000 visits per month	6100 views in total
Social media	100 followers per year	109 followers on X 135 and LinkedIn
Communication materials	Logo and visual identity (brand), Word and PowerPoint templates, brochure, roll-up banner, poster, social media visuals, standard presentation, flyers, key messages	Communication toolkit with all templates, 3 flyers (brochure, pilots infographics, and 1 infographic)
Media coverage	2 newsletter per year +8 blog posts per year	1 <sup>st</sup> done, 2 <sup>nd</sup> in M24 10 blog posts on the website
Deliverables	4+ deliverables presented in a user-friendly way	M20 onwards
Publications	10+ scientific publications;	M20 onwards
Attendance at industry fairs / events	10+ presentations or posters 10+ industry fairs and events	3 posters, 1 presentation at conference
1 Open Day in each pilot	100+ participants 3+ other EU projects involved	M24 onwards
Green Infrastructure game	Deployed in Open days in the pilot regions	M30 onwards
Circularity Fresk workshops	Organise 1 workshop in collaboration with local university – Over 200 participants	M24 onwards
Videos	5 videos	1 developed and published on Slovenian pilot
Policy brief	50+ infrastructure owners receiving the policy brief	M30 onwards

## 2.5 External communication

**Objectives:** Raise awareness of sensitive environmental topics such as environmental impact of transport infrastructure, increase visibility of CIRCUIT and its research

**Means of dissemination:** website and social media management

**Target groups:** All target groups

**Impact:**

- Social media campaigns to raise awareness of circular transport infrastructure have increased the number of followers on CIRCUIT accounts.
- Social media campaign for the Slovenian pilot has increased the number of stakeholders participating in ZAG Open day event.

### 2.5.1 Website

**The CIRCUIT project website serves as the main communication and dissemination channel to inform and educate the stakeholders and public. It includes project objectives, progress updates, challenges faced, pilot results, news and other resources.**

The website was published in M3. Over the recent months, the website has been updated, incorporating new design elements and updated content. The website improvements focused on enhancing usability, accessibility, and engagement by streamlining content and introducing interactive features. Key updates included reducing redundancy by merging pages like "Resources & Publications" into a unified "Resources" page with an introductory section to guide users. A "News & Events" page was created with a summary and dynamic event calendar, while a detailed FAQ page was added to address common queries like "what does GPP stand for?". Readability was improved with adjustments to font size, color schemes, and consistent headers across pages. The home page now features interactive maps for pilot locations and clear calls to action, while the "About" page introduces an interactive timeline showcasing the project's history and achievements. Pilot pages were updated with templates, summaries, and before-and-after visuals. A redesigned "Resources" page organizes materials into searchable categories like infographics and videos, aligning with the project's mission to demonstrate its positive impacts. Social media links were relocated to the footer for better visibility, and efforts were made to populate sections with engaging content, such as general assembly updates and success stories, to increase user engagement and highlight project milestones.

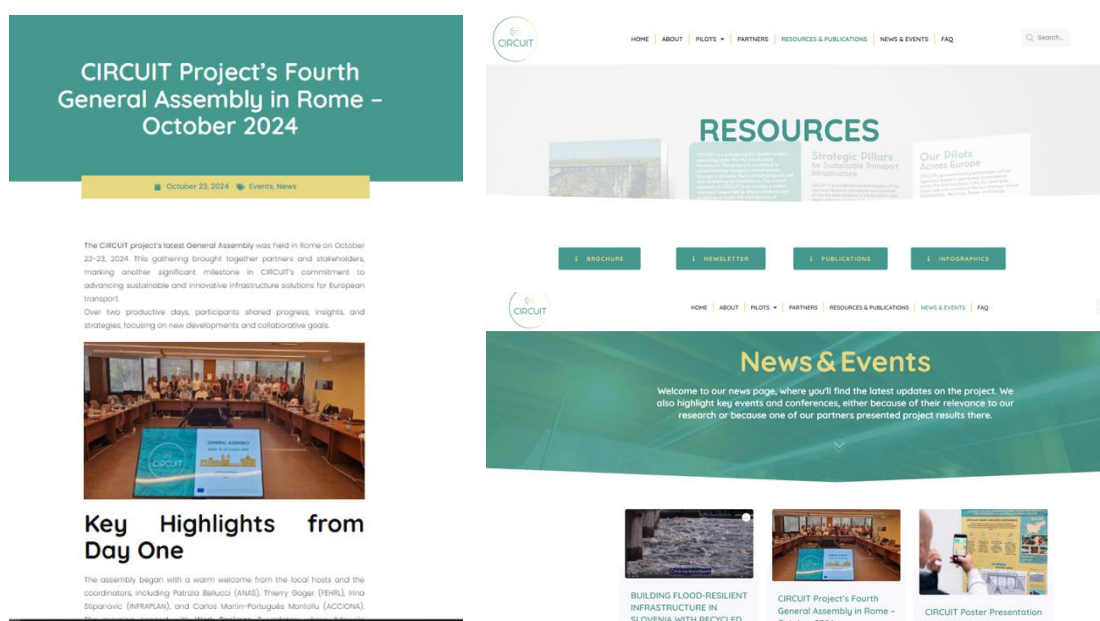


Figure 1 CIRCUIT website update

## 2.5.2 Social Media

CIRCUIT has launched two social media accounts, LinkedIn and X. According to the initial plan, no further social media platforms were about to be opened. The progress made in social media is remarkable and is clearly reflected in the engagement rate and the number of followers. Currently, the social media followers are 140 on LinkedIn and 109 on X. The reason LinkedIn is a more popular social media platform than X is mainly because the project aims to attract professionals in the water management sector, as well as scientists and researchers of this field who are more familiar with LinkedIn than X. In addition, due to recent developments and ethical considerations with X, many individuals have decided not to use it anymore.

**Table 7** Social media metrics overview (May 2023 – October 2024)

Metrics	LinkedIn	X
No. of followers	140	109
Impressions	18 600	-
Reactions	570	-
Reposts	10	-
Engagement rate	%	%

In relation to the KPIs, as mentioned, stable progress has been achieved in both channels. Over the past few months, the project has nearly reached its goal of gaining 50 followers every six months. This progress reflects the systematic efforts in organizing and sharing campaigns, informational materials, interviews, and international reports. The second phase of the project will focus on increasing these numbers.

### 2.5.3 Communication materials

**Objectives:** Effectively communicate the project's objectives and the future technological solutions that will be tested in the 5 case study areas; Croatia, Spain, Netherlands, Slovenia and Italy & create brand guidelines and develop a distinctive and broadly recognised visual identity

**Results/ activity disseminated:** various dissemination/communication materials

**Target groups:** All target groups, specifically the transport infrastructure community in conferences, and local stakeholders including decision-makers i

**Impact achieved:** Increasing visibility of the CIRCUIT project, its objectives and expected impacts.

- Roll up was used in all CIRCUIT general assemblies and in Connecting Europe Days 2024
- A total of 250 flyers were distributed
- Poster was presented at ZAG anniversary

The project has developed communication support materials to support consortium partners in communicating about CIRCUIT. Materials such as a flyer and a rollup have been designed in M6 and they were included in D6.2. Additionally, infographics and a scientific poster has been developed.

### 2.5.4 Education

The CIRCUIT project will undertake two key educational actions to engage the broader community in sustainable practices:

1. **Circular Fresk Workshop:** One Circular Fresk workshop will be conducted in each of the pilot locations in collaboration with local universities. These workshops aim to raise awareness about the construction sector's influence on climate change. They will be organised in the second half of the project. Key Performance Indicators: Targeting participation from more than 150 students and citizens in these workshops.
2. **Green Infrastructure Game:** An educational game will be designed during the second half of the project to facilitate the understanding of the impact of public infrastructure, its various types, and the exploration of innovative solutions to address climate change and extreme events. This game will be featured during open days held in the pilot regions.



## 2.6 Dissemination

### 2.6.1 Events

The following table provides a summary of key events and conferences where CIRCUIT partners disseminated project results during the first 18 months of the project and engaged with various target groups. These events played a crucial role in sharing insights, fostering collaboration, and increasing the project's visibility.

**Table 8** Summary of the events and conferences where partners disseminated CIRCUIT

Partner	Date	Target groups	Event's name	Size of the event
FEHRL	14 – 17/11/2023	Industry, business partners, Innovators, National authorities, Regional authorities, Research communities	IRF Global Roads2Tomorrow (R2T) Conference & Exhibition, Phoenix	>600
FEHRL	9/01/2024	National authorities, research communities	FEHRL – FHWA Workshop, Washington	25
FEHRL, ERF	2 – 5/04/2024	Industry, business partners, innovators, EU Institutions, National authorities, research communities	Connecting Europe Days 2024, Brussels	>3200
FEHRL	14 – 17/04/2024	Industry, business partners, innovators, EU Institutions, National authorities, research communities	TRA2024 Conference, Dublin	>4000
UNIZAG, INFRA PLAN, HAC	11 – 15/05/2024	Research communities	CETRA 2024 - 8th International Conference on Road and Rail Infrastructure	>200
FEHRL	17 – 18/06/2024	Research communities, national authorities	FEHRL General Assembly, Budapest	>20
INGEO, WSHD, UZ	8 – 12/10/2024	Research communities	EUROENGEO 2024 – 4 <sup>th</sup> European Regional Conference of IAEG	>200
ZAG	15/10/2024	Civil society, research communities	ZAG Open Day	30

### 2.6.2 Publications

In addition to scientific presentations, CIRCUIT is committed to publishing the project's outcomes in recognized scientific journals, following an open-access policy. The target is to achieve at least 10 publications in relevant journals and conferences. As of October 2024, no articles have been published yet; however, this will be a primary focus during the project's second phase, aligned with ongoing research and development progress.



### 2.6.3 Newsletter

FEHRL coordinated the first CIRCUIT newsletter together with ERF and RC. The template was designed using BREVO, an email campaign platform. Once finalized, the newsletter was distributed to ERF's entire database and published on the CIRCUIT website: [Read the first CIRCUIT Newsletter](#)

To extend its reach, the newsletter was further promoted across social media channels and featured in the FEHRL newsletter, collectively reaching an audience of over 7,000 people. This inaugural edition provided an overview of CIRCUIT's various pilot projects, key events, and significant achievements from the first year, helping to raise awareness and build interest in the project's ongoing activities.

### 2.6.4 Video production

During the first 18 months of the project, a video was produced in coordination with RC, ZAG, ERF, and stakeholders from the Municipality of Črna na Koroškem to highlight the CIRCUIT pilot site in Slovenia.

**Showcasing CIRCUIT's Sustainable Pilot in Črna na Koroškem, Slovenia:** Following severe flooding in August 2023 that devastated local infrastructure and led to EU assistance, the CIRCUIT project adapted its pilot activities to address the urgent recovery needs of Črna na Koroškem. The video illustrates CIRCUIT's commitment to creating flood-resilient infrastructure by incorporating recycled materials, such as repurposed steel girders, biomass ash, and 3D-printed elements. These sustainable materials contribute to both the circular economy and the resilience of the region's rebuilding efforts: [Watch the video here](#)

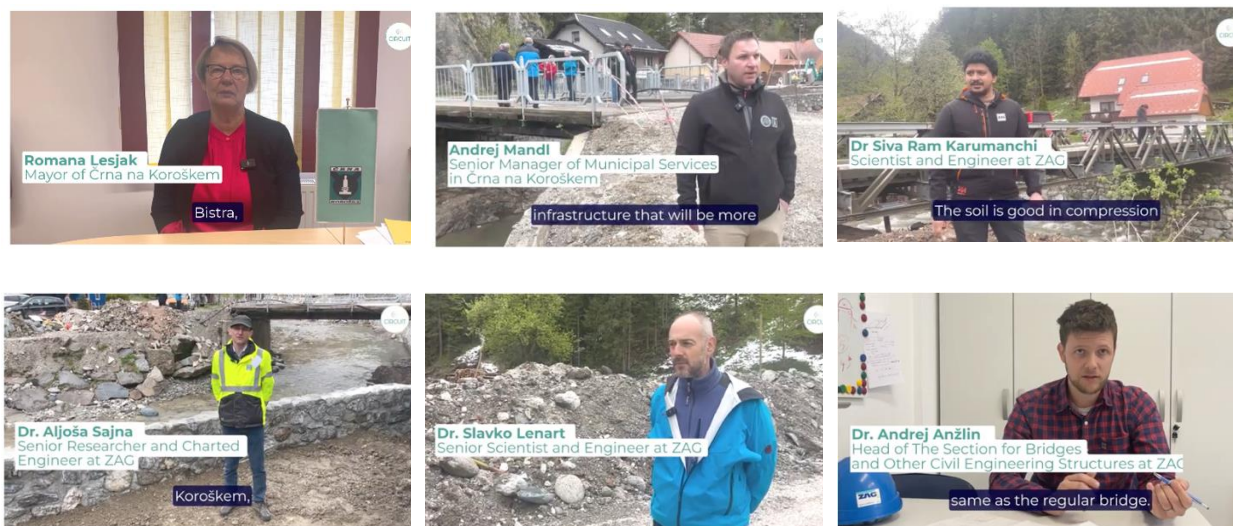


Figure 2 CIRCUIT video clips on Slovenian pilot

**Future Video Productions:** In the second half of the project, a dedicated video will be produced for each CIRCUIT pilot site to showcase unique applications and outcomes across different locations. These videos will be developed in collaboration with WP5 to ensure consistent dissemination and outreach. Additionally, further videos are planned to document the development and deployment of innovative technologies from WP3.

### 3 CIRCUIT Exploitation strategy and plan

#### 3.1 CIRCUIT exploitation approach

The concept of exploitation differs from the concept of dissemination, although an effective exploitation strategy should include both dissemination and exploitation activities. In this regard, it was crucial to understand the concepts of dissemination and exploitation and this was part of the discussions on this first period.

**Dissemination** is the public disclosure of the results by any appropriate means (other than resulting from protecting or exploiting the results), including by scientific publications in any medium

**Exploitation**, on the other hand, is the utilisation of results in further research activities other than those covered by the action concerned, or in developing, creating and marketing a product or process, or in creating and providing a service, or in standardisation activities or in creating a policy change.

Even though exploitation and dissemination are different concepts, the CIRCUIT project considers that an exploitation strategy is intrinsically linked to the development of dissemination activities. Thus, while dissemination is related to making the results of the project visible, the exploitation is responsible for guaranteeing the use of the project results in other activities during and after its implementation.

#### 3.2 Our methodology

CIRCUIT project includes a specific task under WP6, **Task 6.4 Co-design of business models and Exploitation (M10-M48)**, dedicated to the development of exploitation strategies and marketability for the Key Exploitable Results (KERs) within CIRCUIT.

The task employs a structured, four-phase methodology to ensure comprehensive exploitation strategies and commercial readiness, while maintaining a strong link to dissemination activities.

The methodology is illustrated in the figure below:

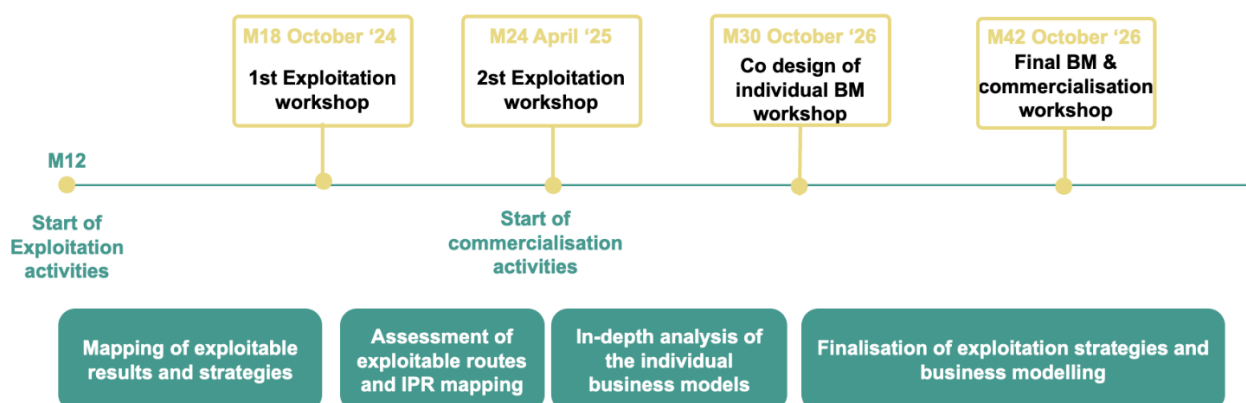


Figure 3 CIRCUIT Exploitation methodology

## PHASE 1: IDENTIFICATION AND DEFINITION OF KEY EXPLOITABLE RESULTS (KERS)

- This phase focuses on understanding and defining the project's primary KERs, mapped to each work package. It includes identifying potential beneficiaries and end users and preliminary exploitation routes.
- During the proposal stage, eight KERs were initially mapped. By M18, this number expanded to 19 KERs following an exploitation workshop held during the GA in Rome. This workshop facilitated initial discussions on potential exploitation routes (details in Section 3.3).



Figure 4 Exercise conducted during the first exploitation workshop (M18)

## PHASE 2: DETAILED ASSESSMENT OF EXPLOITATION STRATEGIES AND IPR

- This phase is dedicated to assessing and refining exploitation strategies for the identified KERs, with a particular focus on intellectual property rights (IPR).
- An IPR workshop will be organized during the M24 General Assembly to finalize the exploitation and IPR strategy linked to the main KERs.

## PHASES 3 & 4: COMMERCIALIZATION STRATEGY DEVELOPMENT

- These phases will focus on designing commercialization strategies for the project's KERs.
- In-depth analysis of individual business models for the main KERs will be conducted.
- RC will facilitate at least two workshops to co-design business models (BMs) and circular organizational models tailored to each pilot project.

This approach will ensure the systematic development of exploitation strategies and business models, paving the way for the successful market uptake of CIRCUIT's results.

### 3.3 Summary of Key Exploitable Results

As a result of the project implementation, **19 Key Exploitable Results have been identified in this first phase of the project and will be delivered to contribute to the achievement of the expected impacts.** The achievement of CIRCUIT impacts will be based on an extensive involvement of key stakeholders and was supported by a set of Communication and engagement activities together with data and IP Management strategies to ensure long-term sustainability of the Project.

Due to the research & innovation nature of the project, most of these results are prototypes, data, reports and skills and knowledge.

**Table 9** Summary of CIRCUIT Key Exploitable Results

KERs	Description	Responsible partner (s)	WP
KER #1	The CIRCUIT open- source digital platform	DTT, IPK, ACC.	1
KER #2	The CIRCUIT Analytics Tool	IPK, DTT, ACC.	1
KER #3	CIRCUIT Guidelines and training materials	Guidelines: <b>ERF</b> , FEHRL, RC, DTT, IPK, ACC, Training: <b>UC</b> , UZ, ZAG.	1
KER #4	CIRCUIT surveying services	<b>HAC</b> , IPK	2
KER #5	CIRCUIT Digital Product Passports	BL, IECA, Ingevity, Algorab, Uberbinder	2
KER #6	CIRCUIT Helpdesk for green procurement	<b>FEHRL</b> , RC, ERF, UC, UZ, ZAG.	4
KER #7	CIRCUIT modular solution for prefabricated bridges	<b>BL</b> , IPK, ZAG, CRNA (validation/asset owner)	3&5
KER #8	CIRCUIT 3D printed safety walls	<b>ZAG</b> , IECA, CRNA (validation/asset owner)	3&5
KER #9	Conceptual approach and innovative design considerations for bridges built using reused structural elements.	<b>ZAG</b> , IPK, CRNA (validation/asset owner)	3&5
KER #10	Sulfur-based low-carbon organic polymer binder engineered from industrial and agricultural by-products	<b>UB</b> , MITMA (validation/asset owner).	3&5
KER #11	Formulations of biobinders and asphalt concrete materials including Pitch Tall Oil (PTO) and Reclaimed Asphalt (RA)	- Biobinders: <b>NGVT</b> , ACC. -Asphalt concrete formulations: <b>ACC</b> , NGVT MITMA (validation/asset owner).	3&5
KER #12	Advanced Polymer Modified Bitumen (PMB) to increase the durability of asphalt wearing courses	<b>CEPSA</b> , UC, MITMA (validation/asset owner).	3&5
KER #13	Advanced lighting systems for tunnels.	<b>ALGORAB</b> , ANAS&MITMA (validation/asset owner)	3&5
KER #14	Advanced ventilation systems for tunnels	<b>ACC</b> , ANAS&MITMA (validation/asset owner)	3&5
KER #15	CIRCUIT hybrid lighting poles	<b>ANAS</b>	3&5
KER #16	CIRCUIT innovative solutions for geotechnical structures	<b>UZ</b> , InGEO, WSHD (validation/asset owner)	3&5
KER #17	Conceptual approach for GRS abutments with reutilized infill	<b>ZAG</b> , CRNA (validation/asset owner)	3&5
KER #18	Smart integrated solutions for wrong-way drivers' detection and warning system	<b>UC</b> , MITMA (validation/asset owner)	3&5
KER #19	Circularity Fresk workshop	<b>RC</b>	6

### 3.3.1 KER 1: The CIRCUIT open- source digital platform

Result description	Digital solutions developed in the project: Digital platform (DP) and associated communication systems and tools (DTT)
Type	Data and Databases, Scientific and Technological Advances, Product prototype
Owner(s)	<b>DP:</b> DTT, IPK, ACC.
Exploitation strategy	<ul style="list-style-type: none"> <li>- <b>Launch the platform with an open license</b> for widespread use.</li> <li>- <b>Offer premium features</b> or specialized versions under commercial licenses for CIRCUIT partners and stakeholders.</li> <li>- <b>Encourage continuous updates</b> and feedback to improve platform functionality and enhance user engagement.</li> </ul>
Users (audience)	Road owners and managers; Engineering companies (designers, contractors); Environmental consultancy companies; Scientific and research community.
Impact/degree of innovation	<p>It drives innovation by combining advanced data tools with circular economy principles, supporting informed decision-making in transport infrastructure. Aligned with the EU Circular Economy Action Plan, it fosters collaboration through open-source access and tailored licensing, accelerating sustainable infrastructure development.</p> <p>DP: TRL 7</p>

### 3.3.2 KER 2: The CIRCUIT Analytics Tool

Result description	Digital solution developed in the project: CIRCUIT Analytics Tool (CAT tool) (IPK)
Type	Data and Databases, Algorithm, Scientific and Technological Advances, Product prototype
Owner(s)	<b>CAT tool:</b> IPK, DTT, ACC.
Exploitation strategy	<p>CAT Tool:</p> <ul style="list-style-type: none"> <li>- <b>Provide the analytics tool under an open license</b> for general use, ensuring accessibility to public authorities and organizations.</li> <li>- <b>Create tiered commercial licensing options</b> for engineering companies, with tailored conditions for CIRCUIT stakeholders.</li> </ul>
Users (audience)	Engineering companies (designers, contractors); Road owners and managers for GPP; Environmental consultancy companies; Scientific and research community.
Impact/degree of innovation	<p>Provides advanced analytics tailored to circular infrastructure, enabling data-driven decision-making. The tool incorporates cutting-edge algorithms to optimize resource use and lifecycle assessment, supporting informed planning. Aligned with the EU Circular Economy Action Plan, it facilitates greener infrastructure projects.</p> <p>CAT Tool: TRL 6-7</p>



### 3.3.3 KER 3: CIRCUIT Guidelines and training materials

Result description	Set of Guidelines and training materials including: <ul style="list-style-type: none"> <li>- <b>Distribute guidelines and training materials freely</b> to promote best practices and knowledge transfer.</li> <li>- <b>Offer tailored training sessions</b> for stakeholders, focusing on specific sectors such as engineering, policy-making, and sustainability.</li> <li>- Training materials (TM) for courses and workshops issued by the academic partners in the consortium. There will be among others, specific TM for 1) The overall approach and KPIs proposed, 2) The digital solutions developed, 3) The materials developed and pilots deployed, 4) Policy recommendations and best practices.</li> </ul>
Type	Scientific and Technological Advances. Educational and training materials
Owner(s)	<b>Guidelines:</b> ERF, FEHRL, RC, DTT, IPK, ACC, <b>TM:</b> UC, UZ, ZAG.
Exploitation strategy	Academic and Scientific Exploitation; Policy exploitation,
Users (audience)	Road owners, operators and managers; Policy makers; Engineering companies (designers, contractors); Students; Scientific and research community.
Impact/degree of innovation	Offers a comprehensive knowledge base promoting circularity in infrastructure. The guidelines and training materials are unique in covering governance, best practices, and policy recommendations. This resource bridges the gap between theory and practice, fostering broader adoption of circular economy principles.

### 3.3.4 KER 4: CIRCUIT surveying services

As part of the solutions proposed for Pilot 1 – Croatia, IPK and HAC have identified a new potential KER linked to the use of UAVs.

Result description	Utilization of UAVs equipped with cameras and LiDAR for structural surveys, data collection (including legal and technical procedures), and data application for 3D modeling.
Type	Service, Scientific and Technological Advances, Prototype
Owner(s)	<b>HAC</b> , IPK
Exploitation strategy	<ul style="list-style-type: none"> <li>- <b>Launch surveying service</b> for road owners and operators, leveraging UAVs equipped with advanced data collection tools.</li> <li>- <b>Provide customized packages</b> for different users, including engineering firms and public authorities.</li> <li>- <b>Explore licensing opportunities</b> for UAV surveying services, creating a sustainable revenue stream.</li> </ul>
Users (audience)	Road owners, operators and managers; Engineering companies (contractors);
Impact/degree of innovation	Leverages UAVs equipped with LiDAR for structural inspections, enhancing data accuracy and reducing manual efforts. This innovative surveying approach accelerates digital transformation in infrastructure management, providing cost-effective 3D modeling solutions. TRL 7

### 3.3.5 KER 5: CIRCUIT Digital Product Passports

Result description	A blueprint of digital product passports (DPPs) for the construction materials developed in the project
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Type	Data and Databases. Prototype product?
Owner(s)	CoProducers of the construction materials and products (e.g. BL, IECA, Ingevity, Algorab, Uberbinder), Developers of digital product passport technology – BIM model, EPD, block-chain technology, chip, certification process etc. (DTT, IPK, IECA)
Exploitation strategy	<ul style="list-style-type: none"> <li>- <b>Develop an open-source framework</b> for Digital Product Passports, enabling widespread adoption.</li> <li>- <b>Partner with certification bodies</b> and construction material suppliers to integrate digital passports into existing product databases.</li> </ul>
Users (audience)	Engineering companies (designers, contractors); Certification bodies, Decision makers (road owners, operators and managers) for GPP; Construction materials suppliers.
Impact/degree of innovation	Introduces standardized DPPs for construction materials, enhancing traceability and sustainability. The passports support compliance with EU Green Deal objectives, enabling transparency and circularity in material use, facilitating a digital marketplace for sustainable products.

### 3.3.6 KER 6: CIRCUIT Helpdesk for green procurement

Result description	Helpdesk to promote GPP, IP and the benefits of aligned them with the CIRCUIT project principles.
Type	Product, Policy exploitation, Educational and training materials, Scientific and Technological Advances
Owner(s)	<b>FEHRL</b> , RC, ERF, UC, UZ, ZAG.
Exploitation strategy	<ul style="list-style-type: none"> <li>- <b>Launch an online platform</b> dedicated to promoting Green Public Procurement (GPP) principles and CIRCUIT project insights.</li> <li>- <b>Maintain the platform after project</b> completion by offering subscription-based access for updates, resources, and consultation services.</li> <li>- <b>Encourage policy suggestions</b> and contribute to shaping public procurement laws through the platform.</li> </ul>
Users (audience)	Road owners, operators and managers; Engineering companies (designers, contractors); Policy makers; Civil society (general public); Scientific and research community.
Impact/degree of innovation	Provides an interactive platform to support GPP implementation. The helpdesk offers tailored resources, fostering policy alignment and knowledge sharing among stakeholders. It addresses the need for structured GPP guidance, promoting sustainable procurement practices.

### 3.3.7 KER 7: CIRCUIT modular solution for prefabricated bridges

Result description	CIRCUIT modular solution for prefabricated bridges, manufactured with new formulations of low carbon including the use of SRMs and high-performance cementitious materials.
Type	Product prototype, Scientific and Technological advances, publication
Owner(s)	<b>BL</b> , IPK, ZAG, CRNA (validation/asset owner)
Exploitation strategy	<ul style="list-style-type: none"> <li>- <b>Commercialize the modular bridge solution</b> by licensing the technology to prefabricated concrete companies and manufacturers.</li> </ul>

	<ul style="list-style-type: none"> <li>- <b>Explore joint ventures</b> with infrastructure firms to scale production and implementation.</li> <li>- <b>Leverage EU funding programs</b> to support adoption and implementation of these solutions in large-scale infrastructure projects.</li> </ul>
<b>Users (audience)</b>	Road owners, operators and managers; Engineering companies (designers, contractors); Prefabricated companies and concrete industry; Scientific and research community.
<b>Impact/degree of innovation</b>	Advances modular bridge construction with low-carbon materials, reducing environmental impact. Its prefabricated approach streamlines construction, lowers costs, and supports reuse strategies, aligning with EU Circular Economy goals. TRL9

### 3.3.8 KER 8: CIRCUIT 3D printed safety walls

<b>Result description</b>	CIRCUIT printed safety wall design manufactured with new formulations of mortars that include SRMs in the mix design.
<b>Type</b>	Product, Scientific and Technological Advances.
<b>Owner(s)</b>	<b>ZAG</b> , IECA, CRNA (validation/asset owner).
<b>Exploitation strategy</b>	<ul style="list-style-type: none"> <li>- <b>Launch a prototype of the 3D printed safety walls</b>, offering pilot projects for key infrastructure stakeholders.</li> <li>- <b>Develop further research</b> for scaling production, with a view to commercializing the solution.</li> <li>- <b>Collaborate with concrete manufacturers</b> and public authorities for implementation in key projects.</li> </ul>
<b>Users (audience)</b>	Road owners, operators and managers; Engineering companies (designers, contractors); Prefabricated companies and concrete industry; Scientific and research community; Civil society (general public).
<b>Impact/degree of innovation</b>	Innovative use of SRMs in 3D-printed safety walls, promoting sustainable, on-demand construction. This technology enhances material efficiency and reduces waste, setting a precedent for sustainable infrastructure aligned with the EU Bauhaus initiative. TRL7

### 3.3.9 KER 9: Conceptual approach and innovative design considerations for bridges built using reused structural elements.

<b>Result description</b>	Conceptual approach and design considerations to include reused structural elements for bridges construction (e.g. modular solutions for superstructure with recycled girders)
<b>Type</b>	Product prototype; Scientific and Technological Advances
<b>Owner(s)</b>	<b>ZAG</b> , IPK, CRNA (validation/asset owner)
<b>Exploitation strategy</b>	<ul style="list-style-type: none"> <li>- <b>Develop a prototype</b> based on the conceptual approach and promote it through research publications and industry forums.</li> <li>- <b>Create partnerships</b> with engineering firms and government bodies to test the approach in real-life projects.</li> <li>- <b>Skills and knowledge, Publication.</b></li> </ul>
<b>Users (audience)</b>	Road owners, operators and managers; Engineering companies (designers, contractors); Scientific and research community; Civil society (general public).
<b>Impact/degree of innovation</b>	Pioneers the reuse of structural elements in bridge design, reducing resource consumption. This concept introduces circularity in large-



	scale infrastructure, promoting sustainable engineering aligned with EU policies. TRL7.
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### 3.3.10 KER 10: Sulfur-based low-carbon organic polymer binder engineered from industrial and agricultural by-products

Result description	Organic polymer binder solution engineered to be more sustainable, climate resilient, cost effective and suitable for roads pavements construction.
Type	Product, Scientific and Technological Advances
Owner(s)	UB, MITMA (validation/asset owner).
Exploitation strategy	<ul style="list-style-type: none"> <li>• <b>Commercialize the binder technology</b>, offering it to construction firms and municipalities involved in road pavement construction.</li> <li>• <b>Develop a licensing model</b> to encourage adoption across the European asphalt industry.</li> <li>• <b>Explore partnerships</b> with the chemical and asphalt industries for further refinement and large-scale use.</li> </ul>
Users (audience)	Road owners, operators and managers; Engineering companies (designers, contractors); Asphalt and chemistry industries; Scientific and research community.
Impact/degree of innovation	Provides a scalable, sustainable alternative to bitumen binders using industrial by-products. This innovative binder reduces carbon footprints and promotes industrial symbiosis, addressing EU Green Deal priorities. TRL6-7

### 3.3.11 KER 11: Formulations of biobinders and asphalt concrete materials including Pitch Tall Oil (PTO) and Reclaimed Asphalt (RA)

Result description	New formulations of bituminous binders and asphalt concrete mixtures, including different PTO additions depending on the RA content.
Type	Product, Scientific and Technological Advances
Owner(s)	- Biobinders: <b>NGVT</b> , ACC. -Asphalt concrete formulations: <b>ACC</b> , NGVT MITMA (validation/asset owner).
Exploitation strategy	<ul style="list-style-type: none"> <li>- <b>Launch a product</b>;</li> <li>- Develop a <b>commercial strategy</b> (licensing or direct sales), delivering special conditions for CIRCUIT partners and stakeholders engaged.</li> <li>- <b>Publication</b> and dissemination to influence policy and regulatory change for sustainable road construction.</li> </ul>
Users (audience)	Engineering companies (designers, contractors); Road owners, operators and managers; Asphalt and chemistry industries; Scientific and research community.
Impact/degree of innovation	Utilizes bio-based materials and reclaimed asphalt, reducing reliance on non-renewable resources. This formulation enhances circularity and durability, aligning with the EU Bioeconomy Strategy. TRL 7-8

### 3.3.12 KER 12: Advanced Polymer Modified Bitumen (PMB) to increase the durability of asphalt wearing courses

Result description	New formulations of a highly polymer modified bitumen, containing an experimental polymer, to provide asphalt mixtures with high RA content suitable for wearing/surface courses of asphalt pavements.
Type	Product, Scientific and Technological Advances
Owner(s)	<b>CEPSA</b> , UC, MITMA (validation/asset owner).
Exploitation strategy	<ul style="list-style-type: none"> <li>- <b>Launch a product</b>;</li> <li>- Develop a <b>commercial strategy</b> (licensing or direct sales), delivering special conditions for CIRCUIT partners and stakeholders engaged.</li> <li>- <b>Publication</b> and dissemination to influence policy and regulatory change for sustainable road construction.</li> </ul>
Users (audience)	Engineering companies (designers, contractors); Road owners, operators and managers; Asphalt and chemistry industries; Scientific and research community.
Impact/degree of innovation	Develops durable asphalt solutions using experimental polymers, extending infrastructure lifespan. This innovation supports high RA content in surface courses, driving sustainability in road construction. TRL 7-8

### 3.3.13 KER 13: Advanced lighting systems for tunnels.

Result description	Adaptive lighting systems for tunnels designed considering the safety condition required by CIE 88 (visibility of a reference object at the stopping distance) and measurements of luminance over the full length of the tunnels and external glare conditions.
Type	Product, Scientific and Technological Advances
Owner(s)	<b>ALGORAB</b> , ANAS&MITMA (validation/asset owner)
Exploitation strategy	<ul style="list-style-type: none"> <li>- Commercialize adaptive lighting systems for tunnels, providing <b>discounted or preferential terms</b> for CIRCUIT stakeholders involved in tunnel management.</li> <li>- Explore the <b>ESCO model</b> for service-based contracts, where payments are based on energy savings or system performance, without upfront fees, and maintenance is included in the contract.</li> </ul>
Users (audience)	Road owners, operators and managers; Engineering companies (designers, contractors, installations companies); Scientific and research community.
Impact/degree of innovation	Adaptive lighting technology improves energy efficiency and safety. Real-time luminance control reduces operational costs, aligning with the EU Energy Efficiency Directive. TRL 8.

### 3.3.14 KER 14: Advanced ventilation systems for tunnels.

Result description	Adaptive ventilation systems for tunnels, designed considering safety requirements and optimised ventilation ramps to reduce energy consumptions. This includes remote control of tunnel fans and real-time information on ventilation parameters.
Type	Product, Scientific and Technological Advances
Owner(s)	<b>ACC</b> , ANAS&MITMA (validation/asset owner)

Exploitation strategy	Provide the ventilation systems for tunnel operators with special <b>service agreements</b> for CIRCUIT partners.
Users (audience)	Road owners, operators and managers; Engineering companies (designers, contractors, installations companies); Scientific and research community.
Impact/degree of innovation	Optimized ventilation ramps and remote control systems reduce energy consumption and enhance safety. This technology supports real-time monitoring, contributing to sustainable infrastructure operations. Development aligned with the EU Energy Efficiency Directive and EU Green deal. TRL 7-8.

### 3.3.15 KER 15: CIRCUIT hybrid lighting poles

Result description	Innovative grid-connected hybrid lighting poles equipped with photovoltaic and mini-wind generators suitable for transport infrastructures.
Type	Product prototype for hybrid lighting poles.
Owner(s)	<b>ANAS</b>
Exploitation strategy	Commercialize hybrid lighting poles with <b>special conditions</b> for municipalities and road operators, particularly CIRCUIT stakeholders.
Users (audience)	Road owners, operators and managers; Municipalities; Engineering companies (designers, contractors, installations companies); Scientific and research community.
Impact/degree of innovation	Integrates renewable energy (solar, wind) into lighting infrastructure, reducing operational costs. This hybrid solution promotes self-sustaining infrastructure, aligned with EU energy goals. TRL 7.

### 3.3.16 KER 16: CIRCUIT innovative solutions for geotechnical structures

Result description	A set of optimized solutions which include utilization of industrial by-products for soil reinforcement & soil stabilization, reducing the deposits of industrial by-products & increasing erosion resistance and sustainability.
Type	Product, Scientific and Technological Advances
Owner(s)	<b>UZ</b> , InGEO, WSHD (validation/asset owner)
Exploitation strategy	<ul style="list-style-type: none"> <li>- <b>Market the innovative mixture</b> to infrastructure projects with special offers for CIRCUIT partners and stakeholders.</li> <li>- <b>Publish papers</b> in geotechnical journals and present at conferences to raise awareness in the scientific community.</li> <li>- <b>Propose research projects and PhDs</b> to explore new variations and applications of the mixture in collaboration with universities.</li> <li>- <b>Initiate patent applications</b> for unique aspects of the mixture and its production process.</li> </ul>
Users (audience)	Road owners, operators and managers; Waterboards; Engineering companies (designers, contractors); Scientific and research community.
Impact/degree of innovation	Utilizes industrial by-products for soil stabilization, reducing waste and promoting sustainability. This approach improves erosion resistance, supporting circular infrastructure practices. TRL 7

### 3.3.17 KER 17: Conceptual approach for GRS abutments with reutilized infill

Result description	Management protocols and potential pre-treatments for flood debris as an alternative backfill material
Type	Product prototype, Scientific and Technological Advances
Owner(s)	<b>ZAG</b> , CRNA (validation/asset owner)
Exploitation strategy	<ul style="list-style-type: none"> <li>- <b>Publish papers</b> and present at conferences to raise awareness in the scientific community.</li> <li>- <b>Propose research projects and PhDs</b></li> </ul>
Users (audience)	Road owners, operators and managers; Engineering companies (designers, contractors); Scientific and research community.
Impact/degree of innovation	Repurposes flood debris as backfill material, promoting circular use of resources. This concept reduces environmental impact, enhancing infrastructure resilience. TRL 7

### 3.3.18 KER 18: Smart integrated solutions for wrong-way drivers' detection and warning system

As part of the project development and discussion with the asset owner (MITMA), this KER was slightly re-oriented.

Result description	Image recognition systems to detect opposite direction vehicles and communications and warning systems to inform both the traffic control centre and the driver to rectify his trajectory.
Type	Service, Scientific and Technological Advances , Prototype
Owner(s)	<b>UC</b> , MITMA (validation/asset owner)
Exploitation strategy	<ul style="list-style-type: none"> <li>- Offer the solution to road authorities, operators, and infrastructure companies with special terms for CIRCUIT partners and stakeholders.</li> <li>- Publish findings in traffic safety and smart mobility journals.</li> </ul>
Users (audience)	Road owners, operators and managers; Engineering companies (designers, contractors); Scientific and research community.
Impact/degree of innovation	Leverages image recognition and real-time alerts to enhance road safety. This system improves incident management, contributing to the EU's "Vision Zero" road safety strategy. TRL 7

### 3.3.19 KER 18: Circularity Fresk workshop

Result description	Based on the french methodology Climate Fresk, a collaborative workshop that helps teach audiences about climate change and by having them solve an interactive puzzle as a group. We will develop a methodology for an adapted version focused on circularity on transport infrastructures.
Type	Methodology
Owner(s)	RC
Exploitation strategy	<b>Launch a product:</b> <ul style="list-style-type: none"> <li>• Open licence when used with no commercial purpose (raising awareness)</li> <li>• Fee-based license when used for commercial purposes</li> </ul>
Users (audience)	Schools/Universities, research organisations, non-profits, consultancies

<b>Impact/degree of innovation</b>	Adapts a proven methodology (Climate Fresk) for circular infrastructure education. This interactive tool fills a gap in circularity training, promoting scalable awareness programs.
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## 4 Next steps on dissemination and exploitation

This section outlines the planned dissemination and exploitation activities to effectively communicate project outcomes, engage stakeholders, and ensure maximum impact. By detailing the upcoming initiatives, partners, and target audiences, we aim to foster collaboration, enhance visibility, and promote the practical application of key results. The table below provides an overview of these activities scheduled until M29.

**Table 10** Overview of dissemination and exploitation activities until M29

Type of activity	Details	Where? When? Which partner?	Target groups
<b>Deliverables transformation</b>	1 <sup>st</sup> set of deliverables transformation to short reports + social media campaign	M20 – M22 RC, ERF with task leaders D4.1, D1.2	Local authorities, transport infrastructure management authorities, universities
<b>Research and development progress videos (WP3)</b>	Videos and social media showcasing research advancements	January 2025 – onwards WP3 – WP5	Scientific community, transport infrastructure partners
<b>Oral presentation</b>	Presentations at key conferences and events	Opportunities under consideration	Scientific community
<b>Online webinar</b>	Joint activity with sister projects	M24-M30 online, ERF + partners	Universities, research communities, other sister projects, experts in circular transport infrastructures
<b>Partner Interviews</b>	Social media interviews featuring project partners	Starting January	All target groups
<b>Pilot Site Videos</b>	Two pilot site videos with social media campaigns	M24-M30 RC and pilot leads	All target groups
<b>Circularity Fresk workshop</b>	First Pilot workshop for students	M24 – M26	University Students
<b>Community Open Days in pilots</b>	Green Infrastructure Game, Circularity Fresk, stakeholder engagement,	From M30 onwards	All target groups
<b>2<sup>nd</sup> Exploitation workshop</b>	Workshop on IPR and exploitation pathways	M24 (at GA) Facilitated by RC	CIRCUIT project partners
<b>Business Model Workshop</b>	Co-design of business models for KERs	M30 Facilitated by RC	CIRCUIT project partners