D6.4
Sustainable Business Models & Exploitation Plans

Draft Version (M30)

Regions 4Climate

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List of Acronyms

CA	Consortium Agreement
CIF	Common Innovation Framework
D	Deliverable
EC	European Commission
ER	Exploitable Result
GA	Grant Agreement
IP	Intellectual Property
IPR	Intellectual Property Rights
KER	Key Exploitable Result
R4C	Regions4Climate
RINA-C	RINA Consulting
SBMs	Sustainable Business Models
SPI	Sociedade Portuguesa de Inovação
T	Task
TRL	Technology Readiness Level
WP	Work Package

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Disclaimer

Executive Summary

This deliverable, D6.4 Sustainable Business Models & Exploitation Plans, outlines the strategic framework developed within the Regions4Climate project to ensure the long-term sustainability, scalability, and market uptake of innovative climate resilience solutions. As part of Work Package 6 on Innovation Management and Exploitation, this document presents a comprehensive approach to transforming R4C's research outputs into actionable, economically viable, and socially inclusive business opportunities.

The deliverable builds upon the activities of Task 6.2, led by RINA Consulting, and integrates insights from other key tasks and deliverables across the project. It focuses on the development of tailored, region-specific business models and detailed exploitation plans for the project's Key Exploitable Results (KERs). These models are designed to support climate adaptation efforts in diverse socio-economic and environmental contexts, with particular attention to vulnerable communities, small-scale producers, and women-led initiatives.

Key components of the deliverable include:

- *Exploitation Planning: Strategic roadmaps for the uptake of innovations, including Technology Readiness Level (TRL) assessments and commercialization strategies.*
- *IPR Management: Guidelines for protecting intellectual property through formal and informal mechanisms, ensuring fair ownership and future use of project results.*
- *Business Model Development: Application of the Business Model Canvas framework to define value propositions, customer segments, revenue streams, and key partnerships.*

The deliverable also introduces tools such as the Characterization Table and TRL9 Roadmap Questionnaire, which were developed and tested during two dedicated exploitation workshops (Milestones 11 and 16). These tools support the evaluation and prioritization of KERs, enabling partners to define clear, actionable paths to market or societal impact.

1. Introduction

1.1. Scope of WP6 Innovation Management and Exploitation and T6.2 Exploitation Planning

Work Package 6 of Regions4Climate project plays a pivotal role in ensuring that the innovative climate resilience solutions developed and demonstrated across the partner regions are not only impactful during the project's lifetime but are also positioned for long-term sustainability, replication, and market uptake. WP6 is dedicated to innovation management and exploitation, with the overarching objective of transforming regional climate adaptation actions into scalable, transferable, and economically viable solutions aligned with the European Green Deal and the EU Mission on Adaptation to Climate Change.

WP6 is structured around five interlinked tasks, each contributing to a comprehensive framework for managing innovation, assessing feasibility, and planning for exploitation and replication. These tasks collectively support the development of a Common Innovation Framework (CIF), the creation of region-specific innovation roadmaps (both under T6.1), and the identification of viable business models and exploitation strategies.

Within this framework, Task 6.2 – Exploitation Planning plays a central role. Led by RINA-C, this task focuses on building a robust exploitation framework that ensures the uptake and continuity of R4C results beyond the project's duration. The task is structured around four key components:

- *Market Analysis:* A comprehensive assessment of the current and potential markets for R4C solutions, including market size, growth potential, value chains, and key stakeholders.
- *Business Models and Cases:* The development of innovative, region-specific business models and benefit analyses, taking into account the perspectives of stakeholders and potential commercial actors.
- *Roadmap of Exploitable Results:* A strategic roadmap outlining feasible business cases, technology readiness levels, and pathways to market, supported by gap analyses and stakeholder engagement.
- *Exploitation and IPR Management:* The formulation of detailed exploitation strategies, including intellectual property rights (IPR) management, risk assessments, and mitigation plans to support commercial deployment.

Task 6.2 is closely integrated with other WP6 activities, particularly the innovation screening (T6.3) and replication planning (T6.4), ensuring a coherent and forward-looking approach to exploitation. Through dedicated workshops and stakeholder engagement, T6.2 also supports capacity building (T6.5) and knowledge transfer, empowering regional actors to sustain and scale their innovations. WP6, in particular T6.2, provide the strategic backbone for ensuring that R4C's innovations are not only impactful during the project but also viable, replicable, and transformative in the long term.

1.2. Scope of D6.4 Sustainable Business Models & Exploitation Plans

The primary objective of Deliverable D6.4, titled Sustainable Business Models & Exploitation Plans, is to ensure that the innovative climate resilience solutions developed and demonstrated across the project's partner regions are not only impactful and contextually relevant but also economically viable, scalable, and replicable beyond the project's duration.

This deliverable focuses on the development of a suite of sustainable business models tailored to the diverse socio-economic and environmental contexts of the R4C demonstration regions. These models are designed to support the long-term uptake and market integration of climate resilience innovations, particularly in vulnerable and climate-impacted areas. The business models aim to empower local communities, promote inclusive economic development, and foster green entrepreneurship, with a special emphasis on supporting small-scale producers, women-led initiatives, and cooperative structures.

In parallel, D6.4 outlines detailed exploitation plans for the project's key results. These plans include:

- *Market analysis to identify potential users, customers, and value chains for R4C solutions;*
- *Business case development for selected innovations, including benefit analysis and stakeholder perspectives;*
- *IPR management strategies to safeguard and leverage intellectual property;*
- *Risk assessments to identify and mitigate barriers to market entry and exploitation;*
- *Actionable roadmaps for commercial deployment and policy alignment.*

The deliverable builds upon the innovation screening activities conducted under Task 6.3 and integrates insights from regional innovation roadmaps (D6.2/T6.1), stakeholder engagement, and policy recommendations. It also aligns with broader EU policy frameworks, including the European Green Deal and the Mission on Adaptation to Climate Change.

By providing replicable and scalable models, D6.4 serves as a strategic tool to guide regional authorities, businesses, and civil society actors in transforming climate resilience innovations into sustainable economic opportunities. It lays the foundation for long-term impact, ensuring that R4C's contributions to climate adaptation continue to grow and evolve well beyond the project's lifecycle.

1.3. Synergies with other tasks and deliverables

Deliverable D6.4 plays a central role in translating the project's innovations into long-term and scalable solutions. As already introduced, the foundation of D6.4 lies in T6.2, which is specifically designed to explore market opportunities, assess barriers to adoption, and define intellectual property strategies. This task is closely supported by T6.3, which provides a structured framework for evaluating the feasibility and scalability of the innovation actions developed in the project, under WP5. The insights gathered through the innovation screening process, documented in Deliverable D6.3, directly inform the design of business models that are both realistic and adaptable to different regional contexts.

In parallel, T6.4 may contribute to D6.4 by focusing on replication and scaling. The findings from this task, which are consolidated in Deliverable D6.5, help ensure that the business models are not only tailored to the demonstration regions but also transferable to other European territories. This strategic alignment enhances the potential for broader impact and supports the long-term sustainability of the project's outcomes.

The work carried out in Work Package 5 is also highly relevant. The regional innovation actions provide a real-world testing ground for the solutions being developed by the 12 regions involved in R4C. Regular status reports (such as D5.2, D5.6, D5.7, and D5.12) and the preliminary impact assessment (D5.8) offer valuable feedback on the implementation process, helping to refine the business models and exploitation strategies. The final synthesis of innovation outcomes in D5.23 further enriches this process by capturing lessons learned and highlighting successful approaches.

From a social perspective, the contributions of Work Package 2 are essential. The just transition roadmaps developed in Deliverable D2.4 offer a framework for ensuring that the business models are inclusive and equitable, taking into account the needs of vulnerable communities and promoting social justice alongside economic growth.

Work Package 4 adds another layer of strategic alignment by providing governance recommendations and policy insights. Deliverables such as D4.4 and D4.6 help ensure that the business models are consistent with regional development strategies and smart specialisation agendas. Moreover, the periodic assessments of climate resilience maturity level (D4.2 and D4.7) offer a useful benchmark for evaluating the readiness of each region to adopt and sustain the proposed innovations.

Finally, the communication and dissemination activities in Work Package 7 play a crucial role in supporting the visibility and uptake of the business models. Through visual storytelling, augmented and virtual reality tools, and targeted outreach campaigns, the project ensures that its innovations are accessible and compelling to a wide range of stakeholders, including policymakers, investors, and the general public.

Deliverable D6.4 is not an isolated output but rather the result of a deeply integrated process that draws on the collective knowledge, experience, and tools developed throughout the R4C project. It transforms technical and social innovations into actionable strategies for real-world impact, ensuring that the project's legacy extends well beyond its formal conclusion.

2. IPRs Principles

2.1. Background

Proper intellectual property (IP) management is essential for effectively using project results. This involves evaluating partners' existing knowledge, their contributions to IP, and potential overlaps to form a consortium's IP strategy. The IPR strategy will help partners maximize their strengths and market positions.

This chapter will outline key provisions related to IP rights and the use and dissemination of results from R4C project. Always refer to the Consortium and Grant Agreements and consult the Project Coordinator and Exploitation Manager for any IPR protection issues when developing exploitation agreements.

In the context of Horizon Europe program, Background Information (B) means *"any data, know-how or information whatever its form or nature, tangible or intangible, including any rights such as intellectual property rights, which is:*

- *held by participants prior to their accession to the action.*
- *needed for carrying out the action or for exploiting the results of the action.*
- *identified by the participants."*

In summary, Background encompasses pre-existing intellectual property, expertise, knowledge, and any additional data essential for executing the project. It also includes contributions each partner will bring to the project.

Before the beginning of the project, it is necessary to ensure that all information needed for the smooth running of the project is accessible to all project partners, therefore matters related to access rights have already been addressed in the R4C Consortium Agreement.

2.2. Results (foreground) and BFMULO matrix

Results, formerly called "Foreground" in Horizon Europe projects, mean *"any data, knowledge and information, whatever their form or nature, whether or not they can be protected, which are generated in the action as well as any attached rights, including intellectual property rights".*

Regarding the protection of results and their dissemination, the following aspects should be considered:

- *Owners must ensure adequate protection for the Results capable of industrial or commercial application in conformity with the Grant Agreement and Consortium Agreement.*
- *In the absence of protection and transfer of Results, owner(s) shall inform EC, which may take the responsibility of protection and granting of access rights. Beneficiary concerned may only refuse if its interests are impaired.*
- *Any disclosure (publication, announcements etc.) shall not affect the protection of Results.*

The Consortium Agreement may specify details concerning protection and publication but not in conflict with EC Contract.

In the specific case of R4C project, the Background (B) and Foreground (F) associated with the partners involved in each related exploitable result have been analysed.

The methods of exploitation will be resumed in the following four cases identified by a single letter, describing the intention of the partner to exploit the results by:

- *M = Making the products, manufacturing, and selling or directly implementing through own facilities and skills.*
- *U = Using the result, implemented with own knowledge to develop new ranges of products or newer processing. Furthermore, the direct or indirect use of foreground in further research activities other than those covered by the project, or for developing, creating, and marketing a product or process, or for creating and providing a service.*
- *L = Licensing the result, therefore earning from a negotiation towards third parties outside the Consortium.*
- *O = Other, any other exploitation means (e.g.: consultancy, services, etc.).*

R4C exploitation claims will be analysed and reported in the BFMULO table below where the contribution from each partner to each Exploitable Result will be described in a simple manner.

Below, we reported an example of BFMULO table: the table will be filled using B, F, M, U, L, and O according with the information shared by partners in the next exploitation activities.

Table 1. BFMULO Analysis – Template for R4C project.

KERs Partners	**KER #1**	**KER #2**	**KER #3**	**KER #4**	**KER #5**	**KER #6**	**KER #7**	**…**	**KER #26**	**KER #27**
VTT	B, F, M, U, L, O	…	…	…	…	…	…	…	…	…
FVH	…	…	…	…	…	…	…	…	…	…
DRI	…	…	…	…	…	…	…	…	…	…
HURC	…	…	…	…	…	…	…	…	…	…
REVOLVE WATER	…	…	…	…	…	…	…	…	…	…
RST-TTO	…	…	…	…	…	…	…	…	…	…
BURGAS	…	…	…	…	…	…	…	…	…	…
NATURSTYRELSEN	…	…	…	…	…	…	…	…	…	…
VIA UC	…	…	…	…	…	…	…	…	…	…
REGIONH	…	…	…	…	…	…	…	…	…	…
ZEALCO	…	…	…	…	…	…	…	…	…	…
UCPH	…	…	…	…	…	…	…	…	…	…
ICLEI	…	…	…	…	…	…	…	…	…	…
NCSR D	…	…	…	…	…	…	…	…	…	…
ENGINEERING	…	…	…	…	…	…	…	…	…	…
SPI	…	…	…	…	…	…	…	…	…	…
UNI DOS ACORES	…	…	…	…	…	…	…	…	…	…

KERs Partners	KER #1	KER #2	KER #3	KER #4	KER #5	KER #6	KER #7	…	KER #26	KER #27
AZTI	…	…	…	…	…	…	…	…	…	…
ZABALA	…	…	…	…	…	…	…	…	…	…
TECNALIA	…	…	…	…	…	…	…	…	…	…
CARTIF	…	…	…	…	…	…	…	…	…	…
AGDR-JCYL	…	…	…	…	…	…	…	…	…	…
UH	…	…	…	…	…	…	…	…	…	…
SEI TALLIN	…	…	…	…	…	…	…	…	…	…
SUEZ	…	…	…	…	…	…	…	…	…	…
SITIA	…	…	…	…	…	…	…	…	…	…
RINA-C	…	…	…	…	…	…	…	…	…	…
IHOBE	…	…	…	…	…	…	…	…	…	…
DESMA	…	…	…	…	…	…	…	…	…	…
PAYS BASQUE	…	…	…	…	…	…	…	…	…	…
UPPA	…	…	…	…	…	…	…	…	…	…
FRCT	…	…	…	…	…	…	…	…	…	…
SSSA	…	…	…	…	…	…	…	…	…	…
UNIFI	…	…	…	…	…	…	…	…	…	…
IRIS	…	…	…	…	…	…	…	…	…	…
NEMO	…	…	…	…	…	…	…	…	…	…
REG TOSCANA	…	…	…	…	…	…	…	…	…	…
EKUK	…	…	…	…	…	…	…	…	…	…
SAPA	…	…	…	…	…	…	…	…	…	…
PARNU	…	…	…	…	…	…	…	…	…	…
CYPRUS ENERGY	…	…	…	…	…	…	…	…	…	…
DITHEKET	…	…	…	…	…	…	…	…	…	…
RS	…	…	…	…	…	…	…	…	…	…
ALLMANNA FORVAL	…	…	…	…	…	…	…	…	…	…
NAVALFRESA	…	…	…	…	…	…	…	…	…	…
HORTAFERCAR	…	…	…	…	…	…	…	…	…	…
EUSKALMET	…	…	…	…	…	…	…	…	…	…
…	…	…	…	…	…	…	…	…	…	…

By using the BFMULO matrix, R4C partners can obtain insights into the project's intellectual property landscape, enabling an understanding of each partner's contributions and the intended use of the project results. This information will help in monitoring and managing intellectual property rights throughout the project's duration and support decision-making and future collaborations.

An updated matrix for all project consortium partners will be included in deliverable D6.4, scheduled for M54.

2.3. Access rights

In Horizon programmes, Access Rights refer to the right to use Key Exploitable Results or Background. During the project's implementation stage, partners are required to grant access rights to their background and results to enable other partners to perform their work on the project and/or exploit their results.

Requests for access rights should be made in written form. This could be an email with an acknowledgment of receipt, as specified in the Consortium Agreement. Participants granting access rights may request an additional agreement, particularly when they want to limit the access rights under certain conditions (e.g., stronger confidentiality commitments).

The following table provides an overview of the general conditions for granting access rights as established in the GA (articles 25.2 and 25.3):

Table 2. Overview of the general conditions concerning granting access rights.

Purpose	Access to Background	Access to Results
Implementation of project	Royalty-free, unless otherwise agreed by participants before their accession to the Grant Agreement	Royalty-free
Exploitation of owned project results	Subject to agreement, access rights shall be granted under fair and reasonable conditions (which can be royalty-free)	

These rules apply unless stated otherwise. The European Union's institutions and bodies have royalty-free access rights for non-commercial and non-competitive use, solely for developing, implementing, and monitoring EU policies and programmes.

2.3.1. Access Rights on the background of the project

Attachment 1 of the CA lists the agreed Background for the Project, noting any legal restrictions on access. Items not listed in Attachment 1 are excluded from Access Right obligations regarding Background. The list of Background contributions will be reported in the final version of this deliverable D6.4.

2.4. Results ownership

As stated in the CA (Section 8.1): *"Results are owned by the Party that generates them."*

In such cases, the Party must ensure, to the extent legally possible, that its employees comply with the obligations regarding Results and Access Rights specified in this CA and the GA.

2.4.1. Joint ownership

As stated in the CA (Section 8.2): *"Joint ownership is governed by Grant Agreement Article 16.4 and its Annex 5, Section Ownership of results, with the following additions:*

- *Unless otherwise agreed:*
  - *each of the joint owners shall be entitled to use their jointly owned Results for non-commercial research and teaching activities on a royalty-free basis, and without requiring the prior consent of the other joint owner(s).*
  - *each of the joint owners shall be entitled to otherwise Exploit the jointly owned Results and to grant non-exclusive licenses to third parties (without any right to sub-license), if the other joint owners are given: (a) at least 45 calendar days advance notice; and (b) fair and reasonable compensation.*

The joint owners shall agree on all protection measures and the division of related cost in advance."

2.4.2. Transfer of results

As stated in the CA (Section 8.3), each Party is allowed to transfer ownership of its Results, including shares in jointly owned Results, by adhering to the procedures outlined in the GA (Article 16.4, Annex 5). For third parties specified in Attachment 3 of the CA, other Parties waive their rights to prior notice or objections. However, the transferring Party must inform the other Parties at the time of the transfer and ensure that their rights under the CA and GA remain unaffected. Additions to Attachment 3 after the CA's signing require approval from the General Assembly.

Moreover, in cases of mergers or acquisitions, prior notice may not be required if laws regarding mergers and acquisitions prevent it. The obligations outlined in the CA apply as long as other Parties retain Access Rights or the possibility to request them.

Furthermore, any transfer must ensure that obligations under the GA are passed to the new owner, who must also pass them on during any subsequent transfer. Beneficiaries with access rights must be informed at least 45 days in advance (or less if agreed in writing), and this notification must provide sufficient details about the new owner to assess its impact on access rights. Beneficiaries may object within 30 days of receiving this notice (or less if agreed in writing) if the transfer adversely affects their rights, delaying the transfer until an agreement is reached.

2.4.2.1. Procedure for knowledge management and protection

The technique for knowledge management and protection is useful for IP management throughout the project and serves as an important input for the Exploitation Action Plan. This approach was established using core concepts from the GA and the CA, focusing on assessing Consortium members' backgrounds and monitoring their potential contributions to new IP generation.

When outcomes are deemed attractive for the future commercial potential of one or more partners, necessary procedures to protect the related IP must be performed. IP protection measures (including patents, copyrights, trademarks, registered designs, design rights, databases, trade secrets, confidentiality, and other forms of protection) may be implemented according to the processes currently in place by the concerned partner(s).

As will be explained further in Chapter 4, patents and other IP protection measures could have important costs, so they are “part of the investments” behind the products’ development. For this reason and the need to be economically sustainable, it is better to adopt these measures only to results that have a “commercial potential” able to produce revenues and sustain the cost of the measure itself. However, it is possible to implement IP protections to results without commercial potential, but economical sustainability could be a limiting factor.In line with the Consortium's rules, the Exploitation Manager (RINA-C) will be notified promptly of the intention of the involved partner(s) to protect that IP. Subsequently, the Exploitation Manager will inform R4C Project Coordinator about the IP protection intention.

Any issues arising from the IP protection project will be addressed by the General Assembly to safeguard the research and economic interests of all participating parties. For jointly owned IP, procedures for protection, use, and licensing will comply with the rules set in the Grant Agreement and described in the Consortium Agreement.

Additionally, concerns regarding intellectual property protection will be regularly managed by the Exploitation Manager and the R4C Project Coordinator, and when necessary, by the General Assembly.

3. Knowledge Management and Exploitation

3.1. Knowledge management and protection

Throughout the project, the Consortium will contribute to generating new knowledge essential for achieving the anticipated project outcomes, many of which may be eligible for Intellectual Property (IP) protection. Additionally, it is an obligation and part of the Consortium's interest to disseminate the proposed new methods and tools, including through qualified open-access scientific publications.

This strategy will consider the mandatory requirement for results to be disseminated (including via open access) while protecting the IP rights of Consortium partners, thereby improving the prospects for successful commercial exploitation of the project's results. Consequently, a dedicated procedure for knowledge management and protection has been defined during the proposal stage and will be implemented throughout the project's duration.

3.1.1. Procedure for knowledge management and protection

The knowledge management and protection procedure play a crucial role in IP management within the project and serves as a significant input for the Exploitation Action Plan. This procedure has been formulated by adhering to the fundamental principles outlined in both the Grant Agreement and the Consortium Agreement, with particular emphasis on evaluating the background of Consortium partners and monitoring their potential contributions to new IP generation.

When results are determined to hold promise for the future business opportunities of one or more partners, appropriate steps will be taken to protect the associated IP. These IP protection measures may include, but are not limited to, patents, copyrights, trademarks, registered designs, design rights, databases, trade secrets, confidentiality, and other forms of protection, following the procedures already in use by the concerned partner(s).

In accordance with the defined procedures within the Consortium, the Exploitation Manager (RINA-C) will be informed at the earliest possible opportunity about any intention by the concerned partner(s) to protect that IP. Subsequently, the Exploitation Manager will notify the Project Coordinator regarding the IP protection intention. To safeguard the research and business interests of all involved partners, any issues arising from the IP protection initiative will be addressed by the General Assembly. In instances of jointly owned IP, the protection, use, and licensing procedures will adhere to the rules established in the Grant Agreement and detailed in the Consortium Agreement. Furthermore, IP protection-related matters will be regularly managed in collaboration with the Project Coordinator and, when necessary, discussed within the General Assembly.

Each time certain results are identified to be worth IP protection, legal aspects are handled along with activities aimed at analysing and providing support for filing the IP protection application. If necessary, commercial agreements are also drafted and agreed upon among the relevant actors. Hence, for any protectable IP the following steps are carried out:

- *The partner concerned notifies the Exploitation Manager about the technical contents it would aim to protect and the related ownership rights (including in case of joint ownership).*
- *Preliminary copyright, trademark, or patent searches are conducted by the concerned partner as well as the Exploitation Manager, in order to check 'freedom-to-operate' with the scope of avoiding eventual infringements.*
- *Filing of the related IP protection application is then followed directly by the relevant partner(s), in accordance with the perimeter agreed with the other partners, as well as the perimeter of innovation and in order to maximise the potential for protection of the result.*
- *Any filed application for protection of results will duly include information on the EU funding.*

3.2. Knowledge transfer to industrial partners

In accordance with the guidelines set in the Code of Practice annexed to the Commission Recommendation on the management of intellectual property in knowledge transfer activities, as well as the Model Grant Agreement, beneficiaries classified as universities or other public research organizations will regard knowledge transfer to relevant stakeholders as a strategic mission to maximize the project's impact.

Therefore, the universities and other public research organizations within the Consortium will ensure that knowledge is effectively transferred. This may be achieved through licensing arrangements with private industrial and commercial entities within the Consortium or potential spin-off companies, should these be identified as the optimal avenues for exploitation according to the final exploitation action plan.

3.3. Dissemination and exploitation of results

In Horizon Europe, dissemination refers to the public disclosure of results through appropriate means, excluding those resulting from protecting or exploiting results. Examples of dissemination activities include scientific publications, specific technical information on websites, and participation in conferences or trade fairs.

According to the general Model Grant Agreement, dissemination activities must be undertaken starting from the beginning of the project. Under the leadership of REVOLVE and the supervision of the Project Coordinator, all partners are required to proactively contribute to dissemination activities. Roles and responsibilities of each partner have been clearly agreed upon at the beginning of the project through a dissemination plan (see deliverable D7.2 and its further versions identified in D7.4 and D7.8) and coordinated actions.

Before any dissemination activity, other partners must be consulted so they can exercise their right to object if such dissemination could significantly harm their background or results. Specifically, at least 45 calendar days' prior notice of any dissemination activity shall be given to the other beneficiaries concerned, who may object to the dissemination activity within 30 days.

A new requirement of Horizon Europe is for participants to ensure open access to project results, free of charge for any user, to all peer-reviewed scientific publications relating to its Horizon Europe project's results. This does not obligate participants to publish their results nor affect their plans for exploitation. Participants first decide on the

protection of their results and then consider if and when dissemination should occur through open access scientific publications.

Participants receiving European Union funding must make their best efforts to ensure the exploitation of their results up to four years after the project. This includes steps to ensure results are used:

- *in further research activities beyond those covered by the project,*
- *in developing, creating, and marketing products or processes,*
- *in creating and providing services,*
- *in standardisation activities.*

Exploitation can be performed directly by the participants or indirectly by licensing the results or assigning them to third parties, according to the requirements established in the Grant Agreement.

4. IPR Protection Strategy

This chapter outlines the IPR Protection Strategy, in alignment with both Grant Agreement and Consortium Agreement. Beneficiaries who have received grant funding are required to protect their results adequately, for an appropriate duration and within suitable territorial boundaries, if protection is feasible and justified. This should consider all relevant factors, including potential commercial exploitation, the legitimate interests of other beneficiaries, and any other legitimate interests.

Intellectual Property protection methods can be distinguished in:

- ***Industrial property**, that can be protected through Patents, Designs and Trademarks;*
- ***Non-technical intellectual creations**, e.g. literature or artistic ones including software that can be protected through Copyrights.*

The following figure summarizes these differences:

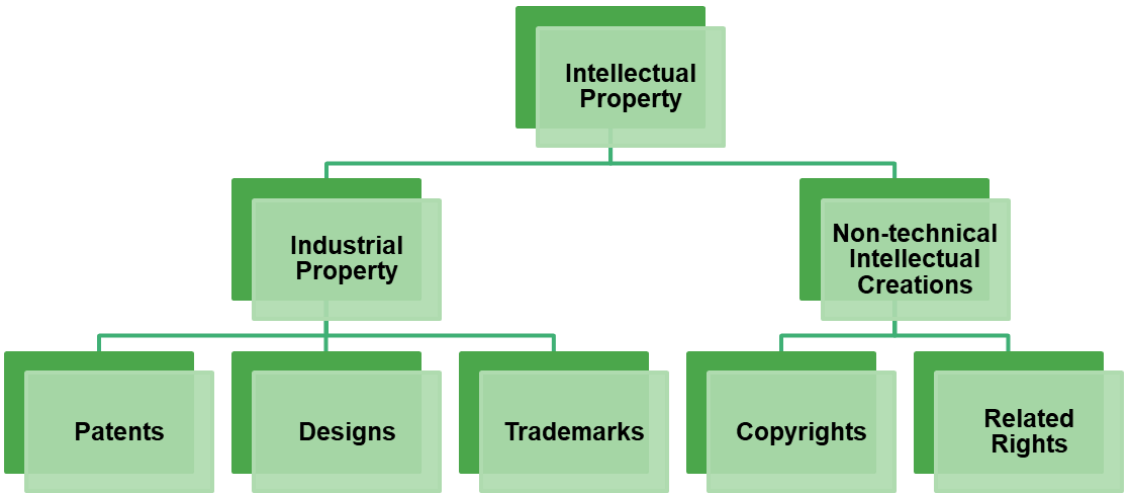

Figure 1. Main Intellectual Property Rights (IPRs).

The suitable form of IP protection, along with its duration and geographical coverage, depends on the results involved, the commercial plans for their exploitation, and the interests of Consortium partners.

There are two different group of IP protection methods, both with the goal to protect the innovation developed by the innovator or the company: **formal** and **informal**.

Formal IP protection methods are intended to encourage innovation by offering a reward mechanism that permits innovators to gain profits if their innovations succeed. These methods allow innovators to exclude imitators for a specified duration.

The table below lists some common formal measures of intellectual property rights (IPRs).

Table 3. Most common formal IPRs measures.

Patents	A patent is an industrial property right that protects a technical invention for a limited period of time (usually 20 years), giving the owner the exclusive right to prevent others from selling, manufacturing and using the patented invention. To be patentable, an invention must meet three criteria: • *it must be new,* • *innovative, and* • *susceptible of industrial application.*
Utility Models	A utility model is an exclusive right granted for an invention, which allows the right owner to prevent others from commercially using the protected invention, without his permission and for a limited period (usually between 7 and 10 years, with no possibility of extension or renewal). It can be any useful machine, tools, instrument, product, composition, process, improvement or part thereof, which is of practical utility, novelty and industrial applicability. In practice, utility model protection is often sought for incremental innovations that do not meet the criteria for patentability. Although a utility model is similar to a patent, it is generally cheaper to obtain and maintain, has a shorter grant period, and less stringent patentability requirements. This kind of solution can be evaluated among the project partners to improve the IP protection.
Industrial Design	Industrial Design is a type of protection dedicated to intellectual creation used by designers. It is intended to protect a shape, configuration, surface pattern, colour or line (or combination of these), which, when applied to a functional product, produces or enhances the aesthetics, and improves the visual appearance of the design, whether it is a two-dimensional or three-dimensional product. The object of design protection is the visible outward appearance of the product or a part thereof, the packaging or the ornamentation itself.
Copyrights	Copyrights protect non-technical intellectual creations.

	It refers to all rights held by creators over their literary or artistic work. To be protected by copyright, a work must first have sufficient originality and, secondly, have taken shape. Protection comes automatically by giving the owner the exclusive right to control its reproduction or adaptation.
Trademarks	Trademarks are distinguishing signs that identify brands of products or services. Any symbol that can be graphically represented can be registered as a trademark for a period of 10 years, with the option to renew indefinitely.

On the contrary, **informal IP protection methods** are solutions that inventors and companies can use if their innovation does not answer to the specific requirements needed by the "formal" protection methods. In particular, some informal methods are:

- *Secrecy of information (trade secret);*
- *Confidentiality;*
- *Restricted access to information;*
- *Technical protection (imitation difficult);*
- *Database and network protection;*
- *Components and system design protection.*

The following table lists examples of project outcomes that may be eligible for IPR protection, along with appropriate IPR protection strategies for each.

Table 4. Projects' outcomes and related IPR protection possibilities.

Subject Matter	Patent	Utility Model	Industrial Design	Copyright	Trademark	Confidential Information
Invention	**V**	**V**				**V**
Software[1]	**V**			**V**		**V**

[1] The patentability of software, computer programs and computer-implemented inventions in European Union is regulated by the European Patent Convention (EPC), and in particular article 52, available at: https://www.epo.org/law-practice/legal-texts/html/epc/2020/e/ar52.html

Subject Matter	Patent	Utility Model	Industrial Design	Copyright	Trademark	Confidential Information
Scientific article				V		
Design of a product			V	V	V	
Name of a product, service, or project					V	
Know-how						V
Website			V	V	V	

4.1. IPR protection procedure

Annex 5 and Article 16 of the GA require each beneficiary to consider protecting its results. Beneficiaries must protect their results adequately if possible and justified, considering all relevant factors including prospects for commercial exploitation and the legitimate interests of other beneficiaries.

To ensure appropriate sharing in the protection of joint efforts, partners should notify whenever an invention or any foreground is developed and ensure that the foreground sharing is identified and agreed upon among the partners developing it. This should be conducted on a case-by-case basis under the supervision of the project coordinator, with assistance from the Exploitation Manager.

According to the procedure for knowledge and management protection outlined in the GA, each partner must inform the Exploitation Manager as soon as possible about the technical content it plans to protect and the related ownership rights (including joint ownership). It is recommended to consult with other parties involved before deciding whether and how to protect a specific result.

Any partner intending to apply for any protection measures listed in the previous section must inform the Exploitation Manager of its intention. Subsequently, the Exploitation Manager will notify the Project Coordinator.

The intention to protect the generated foreground must include a brief description of the foreground topic for IPR protection, using the template in the table below.

Table 5. Template to specify the list of patent, trademark, registered design, and other applications.

Type of IP Rights	**Application reference(s)** *(e.g. EP123456)*	**Subject or title of application**	**Applicant(s)** *(as on the application)*
Patent	-	-	-

The template includes several fields to be filled, listed below (some fields could be added if relevant):

- ***Subject****: it uniquely identifies the innovation, enabling quick retrieval of claimed inventions. Partners should use clear and simple language in the "description" field to define the major terms of the invention and accurately describe the project's actions.*
- ***Description****: it must provide enough detail to enable the Exploitation Manager and the Project Coordinator to evaluate whether the application for IPR protection may pose a risk to other Consortium Partners while being sufficiently general to avoid revealing excessive information about the subject.*
- ***Type of protection*** *(Patent, Trademark, Industrial Design, Copyright, Other): it allows multiple choices for indicating different protection techniques. This is recommended for the evaluator's preference but does not limit evaluation activities.*
- ***Protection Rationale and Potential market****: it helps identify the invention's target sector, which can aid in assessing its economic impact and estimating geographical market penetration. This information may be instrumental in determining the locations where the claimed innovation requires protection.*
- ***Scientific Responsible****:*
- ***Keywords****: optional field, but it is highly recommended to provide at least one keyword for the distinct identification of the innovation to facilitate Coordinator and Exploitation Manager in conducting a more thorough review and evaluation of the invention's effectiveness.*
- ***Work Package and Involved Partners****: additional fields to specify WPs in which the innovation was developed and partners involved in the new invention.*

The coordinator will monitor acknowledgements from partners indicating their intention for IPR protection, including the date of each acknowledgement. The intention to file an IPR application must be documented. This is essential for determining the partner's ownership and assigning a specific date to the claimed invention. Along with a brief description of the innovation, this will provide archival material for reference in case of IPR disputes among partners.

The provided template is intended to list patent, trademark, registered design, and other applications. Currently, no applications have been recorded in the project, as confirmed by the partners.

4.1.1. Patent application

Obtaining a patent can provide effective protection for an invention. There are various types of patent protections available, and factors such as the nature of the innovation and the target market can influence the choice of the most suitable option:

- *National Patents,*
- *European Patents,*
- *European or International Filing.*

4.1.1.1. National patents

For applicants targeting a limited number of European countries, the national route might be the most suitable option. This approach involves submitting applications directly to the intellectual property authorities in each country where protection is desired.

Regarding patentability criteria, the patent laws of European Patent Organisation (EPO) member states have been harmonised and standardized through the European Patent Convention (EPC). Nonetheless, pursuing the national route often results in national rights that provide varying levels of protection.

4.1.1.2. European patents

The national approach may be limiting for a partner seeking protection in a broader sector. In this scenario, a European patent may offer a more viable option.

The European Patent Convention (EPC) is a multilateral treaty that established the European Patent Organisation (EPO), providing an autonomous legal framework for granting European patents. However, the fees associated with EPO patent applications are higher compared to those imposed by national patent offices. It is important to note that EPO fees do not cover the actual grant of patents by individual countries, necessitating additional official fees when the patent is validated in each country where protection is sought.

Given the expenses involved in the European grant procedure, including representation by a single agent and conducting proceedings in one language, the cost of acquiring a European patent can be equivalent to obtaining three or four national patents. Therefore, if protection is desired in more than two or three of the EPC member nations, the European Patent procedure is likely more convenient. Conversely, if protection is needed in only two countries, separate national applications will probably be more economical.

4.1.1.3. European or international filing

The Patent Cooperation Treaty (PCT) is an international treaty that simplifies the process of filing patent applications in its 148 Contracting States. A PCT application sets a filing date in all contracting states and requires entering national or regional stages to obtain patents. This process results in standard national or regional patent applications, which can be granted or denied based on local laws.

For European patents, applicants can choose between the direct European route or the international PCT procedure. Given the European focus of R4C project, the European route is, probably, most relevant.

A European patent application consists of:

- *A request for grant (obligatory), preferably on EPO form 1001;*
- *A description of the invention (obligatory);*

- *Claims;*
- *Drawings (if any);*
- *An abstract.*

5. Exploitation Strategy of Regions4Climate Key Exploitable Results

5.1. Exploitation methodology

The European Commission defines Project Result as follows:

> *"A **Project Result** is defined as any tangible or intangible output of the action, such as data, knowledge and information whatever their form or nature, whether or not they can be protected."*

Project results, also referred to as Exploitable Results (ER), are outputs generated during the project that can be leveraged to create impact. These results may be utilized by project partners or other stakeholders and can include reusable and exploitable items such as inventions, prototypes, and services. Additionally, elements like knowledge, technology, processes, and networks have the potential to contribute to further research or innovation efforts.

The process of exploiting these results involves assessing their application in the development, creation, and marketing of a product or process, providing a service, or participating in standardization activities. According to the European Commission during Dissemination and Exploitation activities, it is important to:

- *Make use of the results for scientific, societal, and economic purposes, or for improving public knowledge and action (e.g. recommendations for policy making); recognising exploitable results and their stakeholders, as a group of entities that are making concrete use of results.*
- *Concretise the value and impact of the Research & Innovation activity for societal challenges; with this respect, partners shall make best efforts to exploit the results they own, or to have them exploited by another legal entity (e.g. through making results available under open licenses).*

In R4C project, RINA-C used a methodology aligned with the Horizon European Framework and is detailed as follows. Initially, the list of project exploitable results was identified in accordance with the Grant Agreement, where applicable. Based on this list, a preliminary confirmation of the roles and responsibilities was shared through email communications and shared with the entire Consortium in a dedicated workshop. This included basic information regarding the definition of Exploitation, the strategy associated and the related tools.

During the ongoing of the project, Characterisation Tables will be shared with the KER leaders to obtain the most relevant information about their KERs. This tool will be constantly updated, providing essential insights. Specifically, the tables are divided into four sections:

- ***Result Description**: This section offers a comprehensive summary of the results obtained from the project or research. It includes a brief description of the result, any innovations introduced, the nature of the result, and the Technology Readiness Level.*
- ***IPR Management**: This section focuses on the management of Intellectual Property Rights (IPR). It outlines the strategies for protecting and managing intellectual property, highlighting Result Owner(s), Result Partner(s), Joint ownership, and the Status of IPR: Background and Foreground.*

- ***Exploitation Strategy**: This section describes the plan for utilizing the project results, identifying the claim and the strategy to follow.*

Market Potential: This section evaluates the market opportunities for the project results, pointing out the target market(s)/sector(s), Customers identification, an analysis of competitors (if any), Time to let the result enter the market and eventually replication partners.

Table 6. Characterization Table template.

<table>
<tr><td rowspan="8">RESULT DESCRIPTION</td><td colspan="10">Title of Key Exploitable Result</td></tr>
<tr><td>Leader Partner Name</td><td colspan="9">Insert name of KER partner's leader</td></tr>
<tr><td>Exploitable Result Short description</td><td colspan="9">Short description of the project result, including its main features, identification the KER as a process, product, service, etc.</td></tr>
<tr><td>Innovation content</td><td colspan="9">Innovation introduced in the market with respect to already existing products, processes, services, etc.
In this section is relevant to report also the competitive advantage, the additional benefit, the differentiation paints with respect to the solutions currently available in the market.</td></tr>
<tr><td rowspan="3">Type of Result</td><td colspan="3">Product/Materials</td><td colspan="3">Process/Technology</td><td colspan="3">Organizational innovation</td></tr>
<tr><td colspan="3">Yes/No</td><td colspan="3">Yes/No</td><td colspan="3">Yes/No</td></tr>
<tr><td colspan="9">Other (specify):</td></tr>
<tr><td rowspan="2">Technology Readiness Level (current, expected)</td><td>TRL 1</td><td>TRL 2</td><td>TRL 3</td><td>TRL 4</td><td>TRL 5</td><td>TRL 6</td><td>TRL 7</td><td>TRL 8</td><td>TRL 9</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="5">IPR MANAGEMENT</td><td>Result Owner(s)</td><td colspan="9">Identification of the party(s) within the Consortium which owns the result</td></tr>
<tr><td>Result Partner(s)</td><td colspan="9">Identification of the party(s) within the consortium which participated in the KER development</td></tr>
<tr><td>Joint ownership</td><td colspan="9">Yes/No</td></tr>
<tr><td>Status of IPR: Background</td><td colspan="9">List of partners providing existing knowledge to the development of the result</td></tr>
<tr><td>Status of IPR: Foreground</td><td colspan="9">List of partners involved, and role effectively covered by them in the development of the final result</td></tr>
</table>

EXPLOITATION STRATEGY	**Exploitation Claim**	**Commercial**	**Industrial processes**	**Consulting**
		Yes/No	*Yes/No*	*Yes/No*
		***Other** (specify):*		
	Exploitation Strategy	**Making**	**Use**	**Licensing**
		Yes/No (specify involved partners)	*Yes/No (specify involved partners)*	*Yes/No (specify involved partners)*
		***Other** (specify involved partners):*		
MARKET POTENTIAL	**Target market(s)/sector(s)**	*Identification of the main application contexts for the KER, including indications for possible alternative/secondary contexts. Required adaptation and modifications to suit specific contexts may be indicated in this section.*		
	Customers identification	*This section should indicate the typical customer for the KER together with a brief description of which need(s) of the customer is addressed*		
	Competition analysis	*The section should indicate existing players in the industry that may be identified competitors as well as, where possible, the competing solution they propose.*		
	Time to market	*The section should indicate when the solution could be ready to be commercialized/implemented in replication scenarios outside the project boundaries.*		
	Replication partners	*This section should indicate whether partner organizations either internal or external the project consortium should be involved in the market penetration phase*		

As the project progresses, the gathered information will be prioritized to identify the most promising results. Tools such as the SBM questionnaire and the TRL9 Roadmap will be shared with the partners. These tools will be explained in detail further in the deliverable.

5.2. Exploitation activities

In

The list of project exploitable results has been identified in accordance with the Grant Agreement n.101093873, the initially identified exploitable results are described as knowledge, products, or technologies recognized at the project's outset. Each result is associated with a specific Work Package and related deliverable(s) that outline the defined objective (see Table below).

Table 7. Initially Exploitable Results' list (from Grant Agreement).

# KER	KER Title	Description	Lead Partner	Contributors	Region/s Involved	Type
#1	**Social & economic vulnerabilities analysis & Just transition framework (WP2; D2.1, D2.2)**	D2.1: Report summarising social and economic vulnerabilities of each of the demonstration site. D2.2: Report outlining how social equity and just transition to climate resilience is to be considered in each of the R4C Challenge Suites.	UCPH, DRI	*Contributors related to deliverables*	NA	*Research/Studies*
#2	**Region-specific SD Models (WP2; D2.3)**	Representation of regional dynamics of resilience allowing prioritisation and impact assessment for each R4C partner region. The models will be presented individually via each partner region's respective Regional Climate Resilience Dashboard and collectively presented in a written report.	VTT	*Contributors related to deliverables*	NA	*Research/Studies*
#3	**Just Transition Roadmaps (WP2; D2.4)**	Actionable plans for achievement of a socially just transition to climate resilience for each of the R4C partner regions. The just transition roadmaps will be presented individually via each partner region's respective Regional Climate Resilience Dashboard and collectively presented in a written report.	DRI	*Contributors related to deliverables*	NA	*Research/Studies*
#4	**Methodological framework for Vulnerability & Risk assessment, & initial visualization of regional V&R (WP3; D3.1, D3.3)**	D3.1.: Methodological framework for regional V&R assessment considering both biophysical resilience and social justice perspectives (reported in D2.1), including associated key indicators of vulnerability and risk. D3.3: Tailored M&E Plans developed in collaboration with regional project partners, to be implemented as part of innovation monitoring activities of WP5.	TECNALIA	*Contributors related to deliverables*	NA	*Methodology*
#5	**Climate Resilience Portal System & Regional Dashboards (WP3; D3.2)**	Implementation of R4C content management system and Regional Climate Resilience Dashboards.	REVOLVE WATER	*Contributors related to deliverables*	NA	*Product*
#6	**RRMM & Framework (WP4; D4.1)**	Online tool that provides a common understanding of the regional climate resilience building process.	ICLEI EURO, ZABALA	*Contributors related to deliverables*	NA	*Product*
#7	**Governance recommendations & Policy briefs (WP4;D4.3; D4.4)**	D4.3: Specific governance recommendations for just, evidence-based regional climate-resilience transitions in each demonstration region. D4.4: Specific policy recommendations that serve as strategic inputs for the ideation of (macro-)regional Smart Specialisation Strategies for Sustainable and Inclusive Growth (S4+) in T4.5.	UH, SEI TALLIN	*Contributors related to deliverables*	NA	*Research/Studies*

# KER	KER Title	Description	Lead Partner	Contributors	Region/s Involved	Type
#8	**R4C CR Innovation Stories and Synthesis (WP5; D5.3, D5.4, D5.5)**	D5.3 Short video highlighting the on-going work in the Front-Runner Region Basque Country related to coastal protection and restoration for climate change adaptation. The video will also provide a brief overview of on-going work in Follower Regions South Aquitaine, Azores and Toscana along with interviews of the leaders of these innovation actions. D5.4 Short video highlighting the on-going work in the Front-Runner Region Køge Bay related to digital tools to support transparent, science-based risk and vulnerability analysis and decision-making processes. The video will also provide a brief overview of on-going work in Follower Regions Uusimaa, Burgas and Pärnumaa along with interviews of the leaders of these innovation actions. D5.5 Short video highlighting the on-going work in the Front-Runner Region of Eastern Crete to address critical socioeconomic impacts of climate change. The video will also provide a brief overview of on-going work in Follower Regions Castilla y León, the Nordic Archipelago and Troodos along with interviews of the leaders of these innovation actions.	AZTI, VIA UC, NCSR "D"	*Contributors related to deliverables*	NA	*Research/Studies*
#9	**Common Innovation Framework (CIF) (WP6; D6.1)**	Holistic and multilevel CIF model and framework and portfolio of climate change resilience solutions.	SPI	*Contributors related to deliverables*	NA	*Framework*
#10	**Regional innovation roadmaps (WP6; D6.2)**	Innovation Roadmaps developed for each partner region incl. short, medium- and long-term milestones towards achieving defined resilience innovation goals.	SPI	*Contributors related to deliverables*	NA	*Research/Studies*
#11	**Innovation screening framework and guidelines (WP6; D6.3)**	Document that describes and instructs on the use of the screening tool to assess the feasibility of regional innovations, their replication and upscaling potential, and how to report progress towards the targets set	TECNALIA	*Contributors related to deliverables*	NA	*Research/Studies*
#12	**Plans for Exploitation, Replication & Scaling (WP6; D6.4, D6.5)**	D6.4 Replicable and scalable sustainable business models and exploitation plans for R4C climate resilience solutions. Draft version at M30, final M54. D6.5 Replication and upscaling strategy and plans for the replication of the sustainable business models developed in D6.2 in line with the objectives of the Green Deal and the Mission Agenda for Adaptation to Climate Change by 2030. Draft version at M48, final M60.	RINA-C	*Contributors related to deliverables*	NA	*Research/Studies*
#13	**Climate risk & innovation visualisations (WP7;-D7.6)**	AR and VR visualisation of main identified risks in each Challenge Suite, a series of 12 GIS Story Maps of innovation actions in partner regions & walkable photogrammetry of selected demonstrations to support decision-making and knowledge-sharing.	VIA UC	*Contributors related to deliverables*	NA	*Research/Studies*

During the ongoing exploitation activities, it has become apparent that some results above may be particularly challenging due to their specific nature (e.g., market research, descriptions).

In M15 and M30, two Exploitation Workshops was held by RINA-C as task leaders of exploitation activities. The workshop focused on the exploitation of R4C project's Key Exploitable Results (KERs), and the agenda included discussions on exploitation objectives, intellectual property rights (IPR) principles, and the illustration of tools such as Characterization Tables, TRL9 Roadmap and Business Model Canvas.

Participants were introduced to these tools to facilitate the identification and planning of KERs, and the workshops emphasized the importance of stakeholder engagement and the need for a strategic approach to commercialization and dissemination of project outcomes.

Both workshops have highlighted the need to focus on characterizing the content of the results described, rather than the deliverable itself. Therefore, a detailed customization of the exploitation roadmap is currently underway in collaboration with the leaders of the respective results to identify the content to be exploited.

The Grant Agreement also reported various technologies that will be advanced during the R4C project; because of their potential for exploitation, they were included in this analysis. The primary leaders, contributors, and regions involved have been identified by RINA-C with essential support from SPI and VTT and the findings related to these technologies, as outlined below, have been implemented and modified. Noteworthy edits include:

- **Result #17**: This result has been divided into two separate outcomes—one pertaining to the Basque country and the other to South Aquitaine.
- **Result #27**: A new result has been created by NCSR D.

The key technologies are listed below.

Table 8. Exploitable Results' list of technologies (from Grant Agreement).

# KER	KER Title	Description	Lead Partner	Contributors	Region/s Involved	Type
#14	**Nature-based coastal restoration solutions**	*Validation of innovative materials, designs & monitoring systems for protecting & restoring degraded coastlines.*	*Regione Toscana*	Regione Toscana, RINA, SSSA, UNIFI, IRIS, NEMO	Toscana	*Product*
#15	**Estuary restoration techniques for climate resilience**	*Validation of innovative practices & monitoring systems to protect & restore degraded estuaries for climate resilience*	*AZT*	AZT, EUSKALMET, IHOBE	Basque Country	*Process*
#16	**Coastal erosion & defence monitoring systems**	*Elaboration & testing of a methodology to assess coastal resilience based on field monitoring.*	*UAC/FRCT*	UAC, FRCT, RST	Azores	*Process*
#17.1	**Operational coastal hydrodynamic model**	*Hydrodynamic prediction for early warning system.*	*AZT*	AZT, EUSKALMET, IHOBE	Basque Country	*Product (Software)*
#17.2	**Operational coastal hydrodynamic model**	*2D wave and run-up prediction in extreme conditions. Fast computing capacity (GPU) for forecasting and early warning.*	*SUEZ (RPT)*	SUEZ (RPT), UPPA, CAPB	South Aquitaine	*Process/Product*
#18	**2D wave runup and overtopping monitoring system (video/Lidar)**	*Increase reliability in complex coastal configurations. Increase of range and resolution.*	*UPPA*	UPPA, SUEZ (RPT), CAPB, AZT	South Aquitaine	*Process*

# KER	KER Title	Description	Lead Partner	Contributors	Region/s Involved	Type
#19	**Water management information systems**	*Enhanced spatial & temporal resolution water monitoring & management system, incl. fusion of satellite-based and in-situ data*	*VTT*	VTT, ALF, Burgas, RST-TTO	Nordic Archipelago, Burgas	*Product (Software)*
#20	**Digital land use & planning tools to address impacts of UHI**	*Tools to predict & visualise climate impacts under user-defined planning & development scenarios, incl. socioeconomic impact*	*VTT*	VTT, ALF, SAPA, PL	Nordic Archipelago, Parnumaa	*Product (Software)*
#21	**Non-polluting, zero emissions greenhouse technologies**	*Greenhouse production enhancement with CO2 from exhaust combustion gases; biofilter for gasification emissions.*	*CARTIF*	NAVALFRESA, HORTAFERCAR, CARTIF	Castilla y Leon	*Product*
#22	**Solutions for carbon neutral and climate resilient touristic activities**	*Innovative solutions for tor carbon neutral activities including energy renovations for hotels, bike paths, info points.*	*NCSR D*	NCSR D, SITIA, CYPRUS ENERGY, TRO	Sitia, Troodos	*Process*
#23	**AR/VR solutions for participatory decision-making**	*AR/VR prototype demonstrations of different climate change vulnerabilities & risks to support participatory decision-making.*	*VIA UC*	VIA UC, RGH, ZEA	Koge Bay	*Product*
#24	**3D "digital twin" covering built & natural elements and capable of supporting ML/ AI applications**	*Integrated visualization of natural elements (e.g., 2D tree register, remote sensed ground cover data, etc.), social & economic data, climate change vulnerability & risk data with built environment information, utilizing existing open data sources, components and standardized APIs.*	*FVH*	HURC, FVH, VTT	Uusimaa	*Product (Software)*
#25	**ML-based application for development & land use planning**	*A process-based modelling suite, enhanced by machine learning-driven optimization, simulating coupled flooding and heat island scenarios in urban environments and integrated via an API into a digital twin*	*VTT*	HURC, FVH, VTT, UH	Uusimaa	*Product (Software)*
#26	**Example architecture(s) of open, standardised API & technology stacks for digital twin applications development and machine learning**	*Documented digital twin example architecture(s) for complete, open technology stacks, with core components deployable as containerised. Digital twin architectures are expected to allow covering both natural and built environments and provide data over standardized APIs to facilitate visualization and machine learning.*	*FVH*	HURC, FVH, VTT, ALF, ENG, UAC, RST	Uusimaa, Nordic Archipelago	*Product (Software)*
#27	**Integrated Pest Management**	*Addressing emerging pests in olive cultivation such as Prays oleate, due to the climate crisis, with environmentally friendly, and low carbon-footprint biological methods. Development of innovative, biodegradable, flowable pheromone formulation in a paraffin-based matrix that may be used for Mating Disruption (MD) of the pest in the framework of Integrated Pest Management (IPM). This type of pheromone formulation can be applied either manually or via Unmanned Aerial Vehicles (UAVs), enabling accurate, efficient, and scalable deployment. The efficacy, precision and cost-effectiveness of this technology promoting sustainable food systems while safeguarding biodiversity.*	*NCSR D*	NCSR D, SITIA	SITIA	*Product*

Many iterations were needed for this first identification of KERs. The initial process of identifying Key Exploitable Results (KERs) presented several challenges. Clarifying the distinction between project deliverables, intended for dissemination, and project results, designated for exploitation, proved to be particularly complex and crucial. Furthermore, the substantial number of results and the involvement of multiple partners in each result added difficulties because the need of a lot of inputs for a detailed exploitation strategy. Despite these obstacles, the Consortium remains committed to fostering collaboration and ensuring the productive application of the project outcomes.

Throughout the project, each identified result will be detailed using the Characterisation Table tool. The most appropriate option for protecting the ERs through intellectual property rights (IPR) will be chosen, and actions will be carried out in collaboration with the responsible partners. Furthermore, as reported in the methodology chapter, RINA-C will use these details to reduce the difficulties described above by prioritising the KERs, focusing on most promising results based on the KPIs provided during the second workshop: *stakeholders' replication* (potential/estimated future users of the results), *innovation introduced in the market* (with respect to already existing products/processes/services), *TRL*, *defined strategies*, *time to market* (please refer to Chapter 8.2 for a detailed description of the workshop and its results). This activity will then prioritise KERs to focus on the most promising ones and both increase partners' participation and improve the effectiveness of the exploitation activities.

Technically, the prioritisation will result in a filtered list of the KERs that will be further analysed using two more tools to cover both the technological and the economical aspects: the TRL9 Roadmap questionnaire and the Sustainable Business Model questionnaire.

These tools, that will be detailed described in following chapters, are applicable only to the most promising innovations because they focus on more specific aspects related to their development and exploitation outside the Consortium (e.g., commercialisation). For this reason, the prioritisation activity is important to define which KERs are more "exploitable" than others, for example the ones for which the TRL scale is useful for their classification, or the description of development activities could be relevant.

6. TRL9 Roadmap

The **TRL9 Roadmap questionnaire** is a tool to understand project results' technology levels and readiness. It focuses also on performed and further foreseen activities to reach TRL 9, the highest level of technological maturity, and overcome it, fulfilling the introduction on the market. It is also used to understand barriers, expected costs and time for next developments, and IPR management aspects such as formal protection methods' application.

The Technology Readiness Levels (TRLs), shown in the following Figure 2, delineate a series of distinct stages, each characterized by specific objectives and demonstrable outcomes. The progression commences at TRL 1, wherein the fundamental scientific principles underlying a potential technology are initially observed and documented. This stage signifies the inception of an idea, marked by foundational scientific observations that suggest future practical applications—essentially the genesis of applied research and development. Advancing to TRL 2, the preliminary technology concept or its specific application is formally articulated. At this juncture, applied research is conducted, primarily through analytical studies and early experiments, to assess the fundamental feasibility and explore possible development trajectories.

At TRL 3, the focus shifts to experimental proof of concept for the technology's critical functions. Laboratory studies are performed to validate analytical predictions and verify that individual components can fulfil their intended roles. TRL 4 emphasizes laboratory testing of prototype components or processes; here, basic technological elements are integrated to demonstrate their collective functionality. These prototypes are typically of "low fidelity," serving primarily to confirm essential functionality rather than to replicate the final product.

As maturity increases, TRL 5 encompasses the testing of integrated components within a simulated but relevant environment. Prototypes at this level achieve "high fidelity," closely resembling the anticipated final system and enabling a more accurate evaluation of performance under conditions representative of real-world application. TRL 6 is marked by demonstration of a prototype system in a relevant environment, involving pilot demonstrations that robustly verify performance and functionality in operational or closely simulated settings.

Upon reaching TRL 7, a pilot prototype system is demonstrated in an actual operational environment. At this stage, the prototype is nearly identical to the intended operational system, with its design largely finalized. The primary objective here is to resolve any remaining engineering and manufacturing risks prior to full-scale production.

TRL 8 designates that the technology is fully developed and qualified. It has been comprehensively validated to operate as intended in its final configuration and under all expected operational conditions, thus confirming its readiness for integration into commercial designs. The culmination of this process is TRL 9, where the actual system has been conclusively proven through successful and sustained deployment in operational settings. The technology, now in its definitive form, is fully mature and ready for widespread commercial adoption.

Although not a formal TRL stage, the phase "Beyond 9" signifies market introduction. This final step encompasses the commercial launch, active marketing, and subsequent adoption of the product, process, or service by its targeted customer base.

In summary, the TRL framework provides a rigorously structured and progressive roadmap for technological development, methodically mitigating risks as innovations advance from initial scientific concepts to established commercial solutions.

TRL9 SCALE

Level	Definition	Description
TRL 1	*Basic principles observed*	Basic Research: basic principles are observed and reported. Lowest level of technology readiness (scientific research begins to be translated into applied R&D).
TRL 2	*Technology concept formulated*	Applied Research: technology concept and/or application formulated. Examples are limited to analytic studies and experimentation.
TRL 3	*Experimental proof of concept*	Critical function, proof of concept established: laboratory studies aim to validate analytical predictions of separate components of the technology.
TRL 4	*Technology validated in lab*	Laboratory testing of prototype component or process: design, development and lab testing of technological components are performed. Basic technological components are integrated to establish that they will work together. "Low fidelity" prototypes.
TRL 5	*Technology validated in relevant environment*	Laboratory testing of integrated system: basic technological components are integrated together with realistic supporting elements to be tested in a simulated environment. "High fidelity" prototypes.
TRL 6	*Technology pilot demonstrated in relevant environment*	Prototype system verified: the prototype is tested in a relevant environment. The system or process demonstration is carried out in an operational environment.
TRL 7	*System prototype demonstration in operational environment*	Integrated pilot system demonstrated: the prototype is near/at planned operational system level. The final design is virtually complete. The goal of this stage is to remove engineering and manufacturing risk.
TRL 8	*System complete and qualified*	System incorporated in commercial design: the technology has been proven to work in its final form under the expected conditions.
TRL 9	*Actual system proven in operational environment*	System ready for full scale deployment: the technology in its final form is ready for commercial deployment.
Beyond 9	*Market introduction*	Market introduction: the product, process or service is launched commercially, marketed to and adopted by a group of customers (including public authorities).

Figure 2. TRL9 Scale. (Source: 2nd Exploitation Workshop)

The TRL9 Roadmap Questionnaire is designed to capture a comprehensive understanding of a technology's maturity, its developmental trajectory, and its future potential. Within the deliverable, this section will serve as a critical component, providing stakeholders with a clear, strategic overview of the technology's current state and its path to market or intended use.

The primary objective of this questionnaire is to elicit detailed insights into several key areas, allowing for a thorough assessment of the technology's readiness and strategic planning.

- *The initial questions aim to **establish the current TRL** of the Key Enabling Result (KER), along with a summary of the development activities already undertaken. This provides a baseline understanding of where the technology stands today. Following this, the questionnaire seeks to **define the target TRL** that is expected to be achieved by the project's conclusion. This clarifies the immediate developmental goals and requires a description of all necessary, ongoing, and foreseen activities to reach that specific maturity level. Essentially, we're mapping the journey from its current state to its near-term objective.*
- *To understand strengths and potential hurdles to the development of the KER, the questionnaire probes for **information on key strengths and enablers**. This includes identifying existing knowledge, specific technologies, or other assets that will facilitate the achievement of the intended TRL. Conversely, it also **asks***

***for the main foreseen barriers and risks**. This proactive identification of challenges is crucial for effective risk mitigation and strategic planning, ensuring that potential obstacles are recognized and addressed.*

- *Beyond the project's immediate scope, a significant portion of the questionnaire is dedicated to **outlining the further R&D activities required to reach TRL 9**. For each subsequent TRL level, from the project's target to full operational readiness, a detailed description of the necessary R&D steps is requested. Accompanying this, an indication of the **expected costs and time** (months/years) needed for R&D at each of these future stages is essential for long-term planning and investment decisions. This section provides a clear roadmap for achieving full technology maturity.*
- *Finally, the questionnaire addresses the **future commercialization potential of the technology**. If commercialization is envisioned, it asks for details on targeted markets, potential customers, specific application sectors, and an estimated time to market. If commercialization is not the goal, an explanation of the intended future uses is required. Moreover, it explores the **strategy for Intellectual Property (IP) protection**, covering both formal and informal measures investigated so far, the rationale behind these choices, and any support needed in this area. This ensures that the technology's value is appropriately secured, and its future trajectory is clearly defined.*

By gathering this comprehensive information, the TRL9 Roadmap Questionnaire enables a robust evaluation of the technology's progress, its inherent potential, and the strategic pathways required for its successful realization and impact. From the information collected through these questionnaires, R4C partners will define successful strategies for the next steps of development of the technologies.

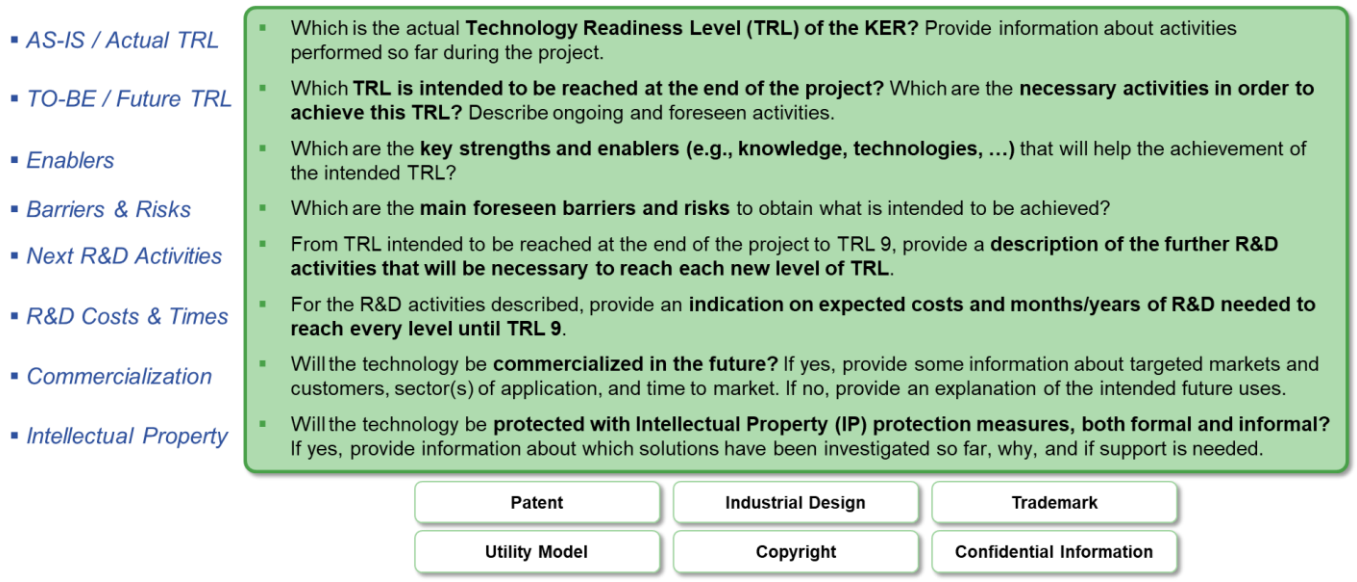

Figure 3. TRL9 Roadmap Questionnaire. (Source: 2nd Exploitation Workshop)

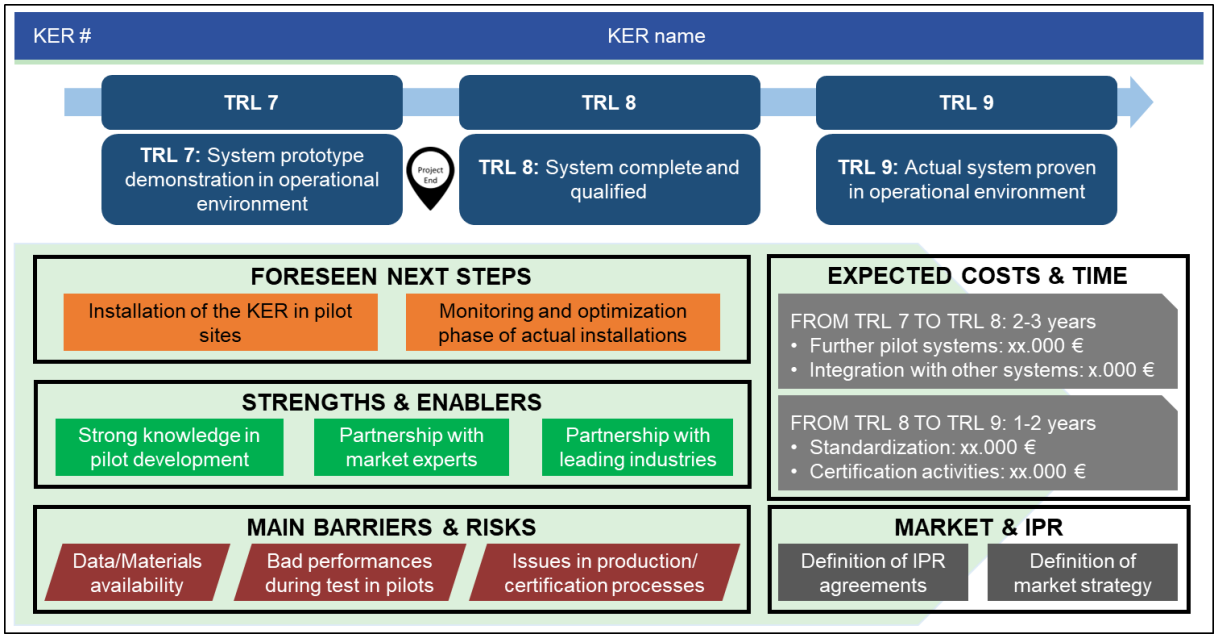

Figure 4. TRL9 Roadmap – Example. (Source: 2nd Exploitation Workshop)

7. Sustainable Business Models

In the context of climate resilience and regional innovation, sustainable business models play a crucial role in ensuring that solutions developed within research and innovation projects can generate long-term value—economically, socially, and environmentally. Unlike traditional business models that focus primarily on financial returns, SBMs integrate sustainability principles into their core logic, aligning value creation with environmental stewardship, social equity, and economic viability.

For the Regions4Climate project, SBMs are essential to support the uptake, replication, and scalability of climate adaptation solutions across diverse European regions. These models are designed not only to bring innovations to market but also to empower local communities, foster inclusive growth, and contribute to the European Green Deal and the Mission on Adaptation to Climate Change.

This chapter introduces the conceptual foundations of sustainable business models and presents the methodology adopted by R4C—based on the Business Model Canvas framework—to guide the development of tailored, region-specific strategies for the exploitation of Key Exploitable Results (KERs).

There are different definitions of "Business Model," in terms of both structure and contents, but in general, a "business model" represents a plan implemented by a company to define a value proposition for the targeted customers, to make it and to gain a part of the economic value generated. A business model can be articulated in conceptual blocks that allow making explicit the most relevant phenomena for the management of a company. This formalism – also known as "Business Model Canvas" – was proposed for the first time by Alexander Osterwalder in his work "Business Model Ontology (2004)" and, afterwards, developed in cooperation with Yves Pigneur and Alan Smith and a community of 470 experts in 45 countries and published in "Business Model Generation (2009)". A brief description and meaning of the different blocks of the Canvas are reported further in this chapter, along with an explanation of their relation to the rest of the Canvas blocks.

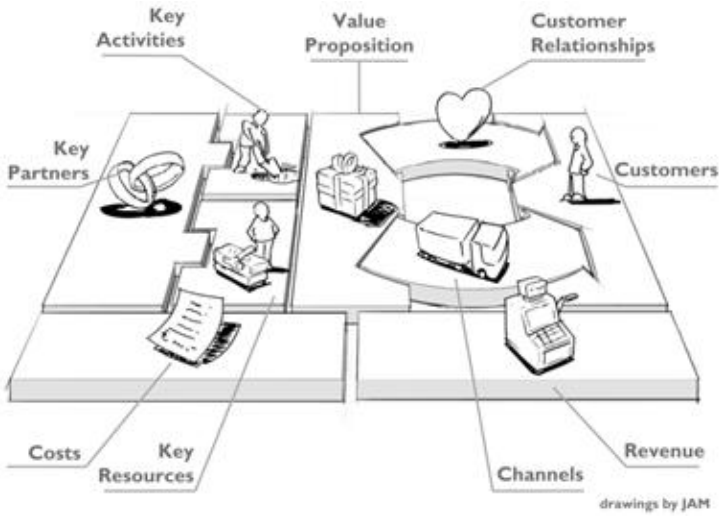

Figure 5. Business Model Canvas Framework.

Business Model Canvas is a complete and systemic method that allows reducing the complexity of the business modelling activity, representing in an effective manner all the parts and internal/external dynamics that are within a Business Model, using a visual language (visual thinking logic).

During the workshops carried out as indicated in Milestones 11 and 16, RINA-C has introduced the main segments about Business Model Canvas, as well as the methodology that will be used during the Business Model activities. In particular, the BMC Framework reports the following 9 blocks:

Value Proposition

The description of the characteristics of the products or services offered should highlight the problems addressed and the anticipated benefits. These can be associated with various aspects such as:

- *Satisfaction of new needs;*
- *Enhanced performance;*
- *Customized solutions;*
- *Reliability;*
- *Innovative design;*
- *Reduction of risks and costs;*
- *Competitive pricing;*
- *Accessibility;*
- *Usability.*

Customer Segment

Identifying customer segments based on their needs and benefits is crucial. The Customer Segments form the core of the business model, serving various types such as mass market, niche market, segmented, diversified, and multi-sided.

Channels

Channels are how a company interacts with customers to deliver its Value Proposition. They significantly impact on customer experience and can be physical (shops) or virtual (e-commerce platforms, website), direct (own shop), or indirect (franchising, wholesaler, distributors).

Customer Relationships

The identification of the type of relationship the partnership needs to establish and maintain with each specific customer segment involves recognising different types of effective customer relationships:

- *Personal assistance based on human interaction.*
- *Self-service, where the customer accesses all necessary information independently.*
- *Automated services, combining advanced forms of customer self-service with automated processes that offer customised services based on customer profiles and needs.*
- *Communities, where companies utilise user communities to engage with customers/prospects and facilitate connections between community members.*

- *Co-creation, where companies collaborate with customers beyond the traditional customer-vendor relationship to create value together.*

Revenue Streams

Identification of the revenue model and product/service pricing model represents the cash flow generated from each Customer Segment. Revenue streams result from value propositions offered to customers, depending on the contract type. Revenues can be derived from various sources: physical (e.g., direct selling, fee proportional to usage), virtual (use of app for selling), grants, and crowdfunding. Different methods to generate revenues include:

- *Asset sale: Selling ownership rights of a physical product;*
- *Usage fee: Generated by the use of a particular service, where customers pay more as they use the service more;*
- *Subscription fees: Generated by selling continuous access to a service;*
- *Lending/Renting/Leasing: Created by temporarily granting exclusive right to use an asset for a fixed period in return for a fee;*
- *Licensing: Generated by giving permission to use protected intellectual property in exchange for licensing fees, allowing rights holders to earn without manufacturing a product or commercialising a service;*
- *Brokerage fees: Derived from intermediation services performed between two or more parties;*
- *Advertising: Resulting from fees for advertising a particular product, service, or brand.*

Key Resources

Identifying key resources necessary for successful operations is crucial. These resources are assets required to offer and deliver the value proposition to customers and may be owned or leased by the company or obtained from key partners.

Key resources can be categorized as follows:

- *Physical assets: manufacturing facilities, buildings, vehicles, machinery, systems, point-of-sale systems, and distribution networks.*
- *Intellectual resources: brands, proprietary knowledge, patents and copyrights, partnerships, and customer databases.*
- *Human resources.*
- *Financial resources and/or financial guarantees: cash, lines of credit, or a stock option pool for recruiting key employees.*

Key Activities

Identification of key actions necessary for a company to operate efficiently. These include creating and offering a Value Proposition, reaching markets, maintaining Customer Relationships, and generating revenues. Key activities may involve:

- *Production: designing, manufacturing, and delivering a product in large quantities and/or high quality.*
- *Problem solving developing new solutions to specific customer issues;*
- *Platform/network: networks, matchmaking platforms, software, and brands can serve as platforms.*

Key Partnership

Identification of Key Partnerships involves describing the network of suppliers and partners essential for the business model's success. Companies form alliances to optimize their business models, mitigate risk, or acquire necessary resources. Certain activities are outsourced while some resources are procured externally.

There are four distinct types of partnerships:

- *Strategic alliances between non-competitors*
- *Strategic partnerships between competitors*
- *Joint ventures aimed at developing new businesses*
- *Buyer-supplier relationships ensuring reliable supplies*

Cost Structure

The Cost Structure describes all costs incurred to operate a business model. It can be useful to distinguish between two broad classes of business model Cost Structures:

- ***Cost-driven**: focuses on minimizing costs wherever possible. This approach aims at creating and maintaining the leanest possible Cost Structure, using low price Value Propositions, maximum automation, and extensive outsourcing;*
- ***Value-driven**: focuses on premium Value Propositions and a high degree of personalized service.*

The categories of cost that interact with a business model include:

- ***Fixed costs**: costs that remain the same despite the volume of goods or services produced, such as salaries, rents, and physical manufacturing facilities;*
- ***Variable costs**: costs that vary proportionally with the volume of goods or services produced;*
- ***Economies of scale**: cost advantages that a business enjoys as its output expands;*
- ***Economies of scope**: cost advantages that a business enjoys due to a larger scope of operations.*

As part of the process to define and prioritize the most promising Key Exploitable Results (KERs), a structured questionnaire will be created and shared with each KER leader. This questionnaire is based on the Business Model Canvas methodology and is designed to gather all the essential information needed to build a complete and tailored business model.

The questionnaire is divided into nine key sections, each corresponding to a building block of the Business Model Canvas. These include Customer Segments, Value Proposition, Channels, Customer Relationships, Revenue Streams, Key Resources, Key Activities, Key Partnerships, and Cost Structure. Additionally, there is a section dedicated to identifying potential risks and barriers to implementation.

Each section contains targeted questions to help the KER leader reflect on the solution's value, its target audience, how it will be delivered and monetized, and what resources and partnerships are needed to make it viable. For example, the Value Proposition section asks what problems the solution addresses and what benefits it offers compared to existing alternatives. The Revenue Streams section explores how the solution could generate income—

whether through product sales, licensing, consulting, or other models—and what pricing strategies might be appropriate.

RINA-C will analyse the responses and use them to draft a preliminary version of the Business Model Canvas. This draft will then be reviewed and refined in a dedicated meeting with the KER leader to ensure the final business model is both realistic and aligned with the project's goals. This process is a key step in ensuring that each prioritized result has a clear, actionable path to market or impact, and that the necessary strategic thinking is in place to support its future development and sustainability.

8. Milestones

In the framework of the Regions4Climate (R4C) project, Milestones 11 and 16 represent two pivotal moments in the strategic exploitation of climate resilience innovations developed across European regions. These milestones are embedded within Work Package 6 (WP6), which focuses on Innovation Management and Exploitation, and are designed to ensure that the project's outputs are not only impactful during the project's lifetime but also scalable and sustainable beyond its conclusion.

8.1. Milestone 11: first workshop on exploitation and IPR management

Milestone 11, conducted at M15, was the first workshop dedicated to maximizing R4C innovations. It was led online (via Microsoft Teams) by Giuseppe Minafra and Fabio Calzia of RINA Consulting as part of Task 6.2 – Exploitation Planning on the 27th of March 2024. The workshop brought together project partners to align on the objectives, tools, and methodologies for identifying and developing exploitable results; the attendants were 15.

The session began with a clear articulation of the exploitation objectives within the R4C framework. The project's overarching aim—to co-develop and demonstrate a socially just transition to climate resilience—was contextualized within a broader strategy to identify and valorise project outcomes that hold potential for real-world application. Exploitation was defined not only as the commercial use of results but also as their uptake for scientific, societal, or policy purposes. This includes further research, service development, policy change, and the creation of spin-offs or start-ups.

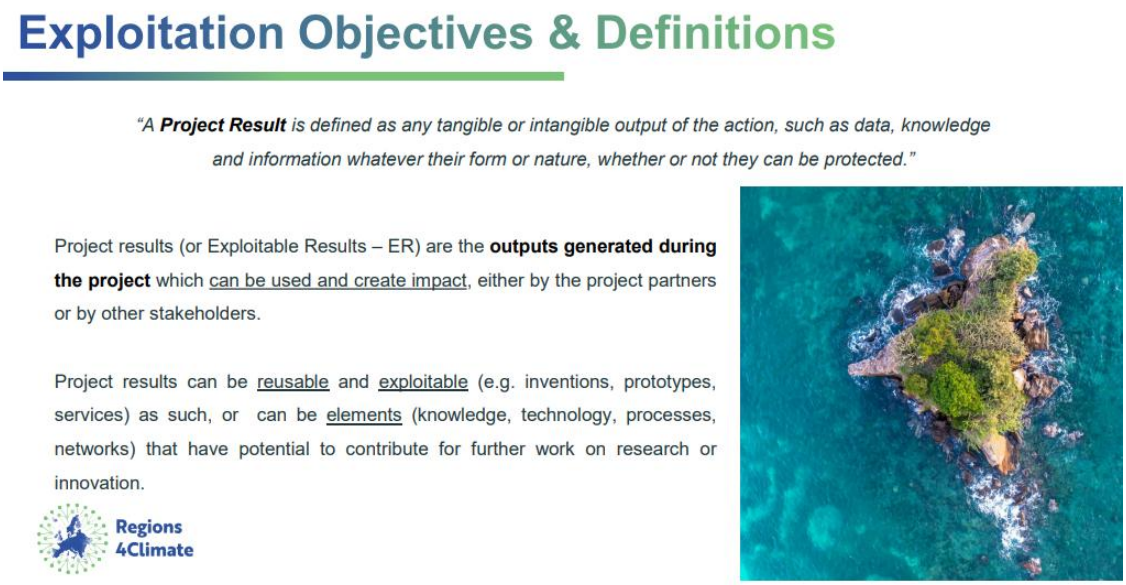

Figure 6. Definition of Project Result. (Source: 1st Exploitation Workshop)

A key focus of the workshop was the distinction between dissemination and exploitation. While dissemination involves making results publicly available, exploitation is about ensuring those results are actively used. The workshop emphasized that all project results - whether tangible or intangible - should be assessed for their potential to generate impact beyond the project's duration.

The second part of the workshop addressed Intellectual Property Rights principles. Participants were introduced to both formal and informal IPR protection strategies, including patents, utility models, industrial designs, copyrights, trademarks, and confidentiality agreements. The importance of distinguishing between background (pre-existing knowledge) and foreground (newly generated results) was highlighted, along with the need for clear ownership agreements, especially in cases of joint development. The exploitation manager, in coordination with the project steering committee, was identified as the key figure for overseeing IPR procedures and ensuring proper documentation and protection of results.

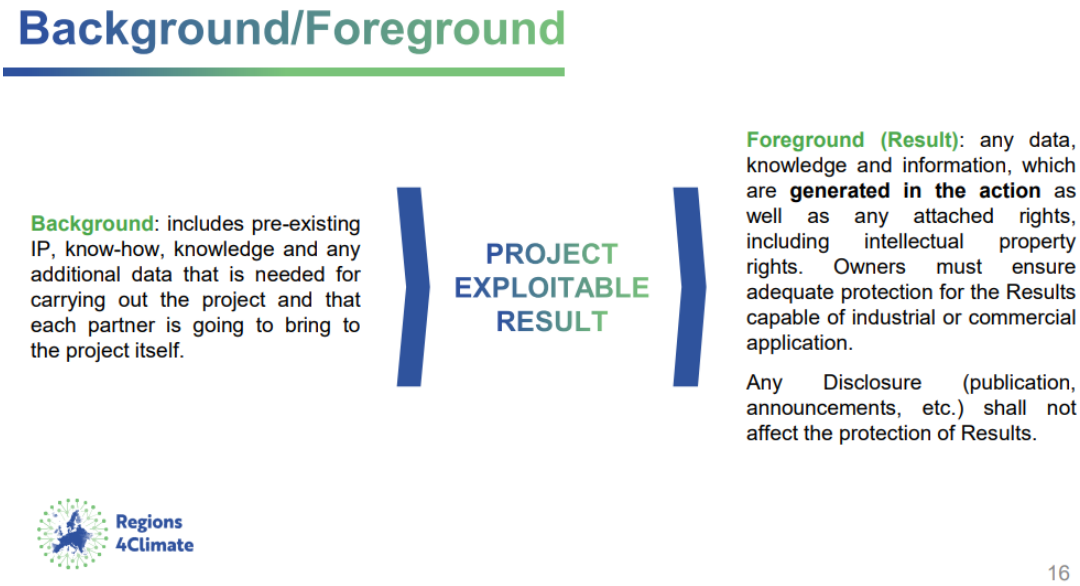

Figure 7. Definition of Background and Foreground. (Source: 1st Exploitation Workshop)

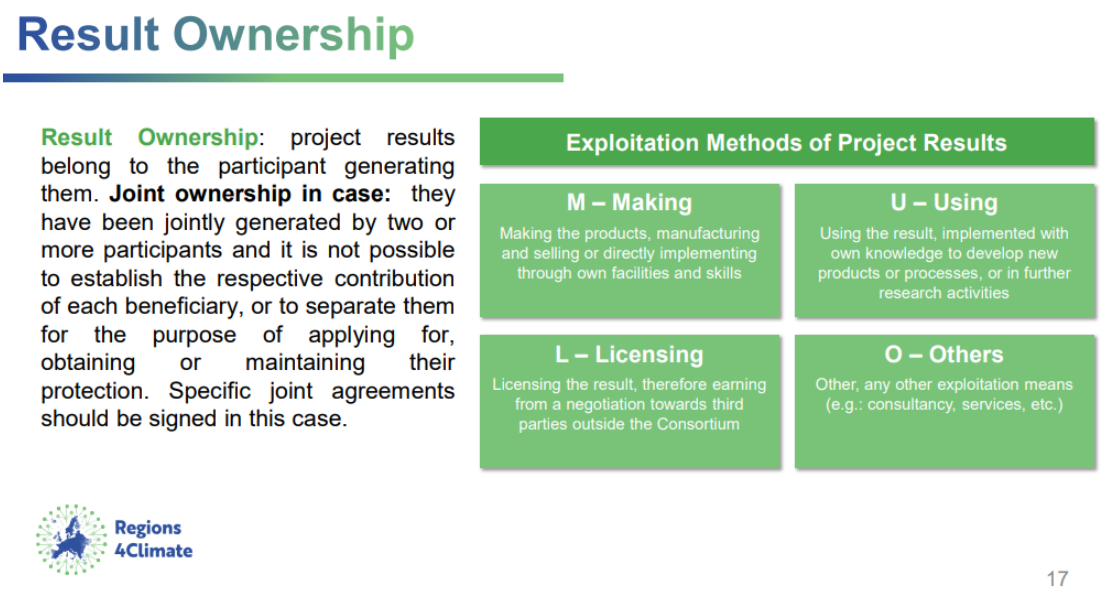

Figure 8. Definition of Result Ownership and Exploitation Methods. (Source: 1st Exploitation Workshop)

The core of the workshop focused on the identification of preliminary Exploitable Results (ERs) across the project's work packages. Twelve ERs were presented, ranging from analytical frameworks and digital platforms to policy recommendations and innovation roadmaps. Each ER was linked to specific deliverables and led by designated partners, setting the stage for deeper analysis and prioritization.

To support this process, the workshop introduced several practical tools. The Characterization Table was presented as a structured template to assess each ER's innovation content, IPR status, exploitation strategy, and market potential. This tool will be used to gather detailed information from the lead partners of each ER. In parallel, the TRL9 Roadmap Questionnaire was introduced to evaluate the current and target Technology Readiness Levels of each result, identify barriers to commercialization, and estimate the time and resources needed to reach full market maturity.

The Business Model Canvas was also discussed as a key framework for structuring the exploitation strategy. Participants were guided through its nine building blocks—value proposition, customer segments, channels, customer relationships, revenue streams, key resources, key activities, key partnerships, and cost structure—highlighting how each element contributes to a coherent and sustainable business model.

The workshop concluded with a roadmap for the next steps. These include the distribution of the Characterization Table to all partners, the prioritization of key exploitable results, and the preparation of the draft version of Deliverable D6.4 "Sustainable Business Models & Exploitation Plans" due at Month 30. Additionally, the second exploitation workshop (Milestone 16) and the final version of D6.4 (due at Month 54) were announced as upcoming objectives.

8.2. Milestone 16: second workshop on exploitation and commercial deployment

The second Exploitation Workshop of the Regions4Climate (R4C) project was held on 22nd May 2025 by Giuseppe Minafra and Fabio Calzia of RINA Consulting during the 3rd R4C Consortium Meeting in Copenhagen in front of all the participants (more than 60 people). It represented a significant step forward in the project's strategy to transform research outputs into impactful, market-ready solutions. Organized under Task 6.2 – Exploitation Planning and aligned with Milestone 16, the workshop was led by RINA Consulting and focused on deepening the understanding of business modelling and technology readiness for the project's Key Exploitable Results (KERs).

R4C KERs 1/4

#	KER Title	Description	Lead Partner	Contributors	Region/s Involved
#1	**Social & economic vulnerabilities analysis & Just transition framework (WP2; D2.1, D2.2)**	D2.1: Report summarising social and economic vulnerabilities of each of the demonstration site. D2.2: Report outlining how social equity and just transition to climate resilience is to be considered in each of the R4C Challenge Suites.	UCPH, DRI	*Contributors related to deliverables*	NA
#2	**Region-specific SD Models (WP2; D2.3)**	Representation of regional dynamics of resilience allowing prioritisation and impact assessment for each R4C partner region. The models will be presented individually via each partner region's respective Regional Climate Resilience Dashboard and collectively presented in a written report.	VTT	*Contributors related to deliverables*	NA
#3	**Just Transition Roadmaps (WP2; D2.4)**	Actionable plans for achievement of a socially just transition to climate resilience for each of the R4C partner regions. The just transition roadmaps will be presented individually via each partner region's respective Regional Climate Resilience Dashboard and collectively presented in a written report.	DRI	*Contributors related to deliverables*	NA
#4	**Methodological framework for Vulnerability & Risk assessment, & initial visualization of regional V&R (WP3; D3.1, D3.3)**	D3.1.: Methodological framework for regional V&R assessment considering both biophysical resilience and social justice perspectives (reported in D2.1), including associated key indicators of vulnerability and risk. D3.3: Tailored M&E Plans developed in collaboration with regional project partners, to be implemented as part of innovation monitoring activities of WP5.	TECNALIA	*Contributors related to deliverables*	NA
#5	**Climate Resilience Portal System & Regional Dashboards (WP3; D3.2)**	Implementation of R4C content management system and Regional Climate Resilience Dashboards.	REVOLVE WATER	*Contributors related to deliverables*	NA
#6	**RRMM & Framework (WP4; D4.1)**	Online tool that provides a common understanding of the regional climate resilience building process.	ICLEI EURO, ZABALA	*Contributors related to deliverables*	NA
#7	**Governance recommendations & Policy briefs (WP4;D4.3; D4.4)**	D4.3: Specific governance recommendations for just, evidence-based regional climate-resilience transitions in each demonstration region. D4.4: Specific policy recommendations that serve as strategic inputs for the ideation of (macro-)regional Smart Specialisation Strategies for Sustainable and Inclusive Growth (S4+) in T4.5.	UH, SEI TALLIN	*Contributors related to deliverables*	NA

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Figure 9. First part of the list of R4C potential KERs. (Source: 2nd Exploitation Workshop)

R4C KERs 2/4

#	KER Title	Description	Lead Partner	Contributors	Region/s Involved
#8	**R4C CR Innovation Stories and Synthesis (WP5; D5.3, D5.4, D5.5)**	D5.3 Short video highlighting the on-going work in the Front-Runner Region Basque Country related to coastal protection and restoration for climate change adaptation. The video will also provide a brief overview of on-going work in Follower Regions South Aquitaine, Azores and Toscana along with interviews of the leaders of these innovation actions. D5.4 Short video highlighting the on-going work in the Front-Runner Region Køge Bay related to digital tools to support transparent, science-based risk and vulnerability analysis and decision-making processes. The video will also provide a brief overview of on-going work in Follower Regions Uusimaa, Burgas and Pärnumaa along with interviews of the leaders of these innovation actions. D5.5 Short video highlighting the on-going work in the Front-Runner Region of Eastern Crete to address critical socioeconomic impacts of climate change. The video will also provide a brief overview of on-going work in Follower Regions Castilla y León, the Nordic Archipelago and Troodos along with interviews of the leaders of these innovation actions.	AZTI, VIA UC, NCSR "D"	*Contributors related to deliverables*	NA
#9	**CIF & Solutions Portfolio (WP6; D6.1)**	Holistic and multilevel CIF model and framework and portfolio of climate change resilience solutions.	SPI	*Contributors related to deliverables*	NA
#10	**Regional innovation roadmaps (WP6; D6.2)**	Innovation Roadmaps developed for each partner region incl. short, medium- and long-term milestones towards achieving defined resilience innovation goals.	SPI	*Contributors related to deliverables*	NA
#11	**Innovation screening framework and guidelines (WP6; D6.3)**	Document that describes and instructs on the use of the screening tool to assess the feasibility of regional innovations, their replication and upscaling potential, and how to report progress towards the targets set	TECNALIA	*Contributors related to deliverables*	NA
#12	**Plans for Exploitation, Replication & Scaling (WP6; D6.4, D6.5)**	D6.4 Replicable and scalable sustainable business models and exploitation plans for R4C climate resilience solutions. Draft version at M30, final M54. D6.5 Replication and upscaling strategy and plans for the replication of the sustainable business models developed in D6.2 in line with the objectives of the Green Deal and the Mission Agenda for Adaptation to Climate Change by 2030. Draft version at M48, final M60.	RINA-C	*Contributors related to deliverables*	NA
#13	**Climate risk & innovation visualisations (WP7;-D7.6)**	AR and VR visualisation of main identified risks in each Challenge Suite, a series of 12 GIS Story Maps of innovation actions in partner regions & walkable photogrammetry of selected demonstrations to support decision-making and knowledge-sharing.	VIA UC	*Contributors related to deliverables*	NA

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Figure 10. Second part of the list of R4C potential KERs. (Source: 2nd Exploitation Workshop)

R4C KERs 3/4

#	KER Title	Description	Lead Partner	Contributors	Region/s Involved
#14	**Nature-based coastal restoration solutions**	*Validation of innovative materials, designs & monitoring systems for protecting & restoring degraded coastlines.*	*Regione Toscana*	Regione Toscana, RINA, SSSA, UNIFI, IRIS, NEMO	Toscana
#15	**Estuary restoration techniques for climate resilience**	*Validation of innovative practices & monitoring systems to protect & restore degraded estuaries for climate resilience*	*AZT*	AZT, EUSKALMET, IHOBE	Basque Country
#16	**Coastal erosion & defence monitoring systems**	*Elaboration & testing of a methodology to assess coastal resilience based on field monitoring.*	*UAC/FRCT*	UAC, FRCT, RST	Azores
#17.1	**Operational coastal hydrodynamic model**	*Hydrodynamic prediction for early warning system.*	*AZT*	AZT, EUSKALMET, IHOBE	Basque Country
#17.2	**Operational coastal hydrodynamic model**	*2D wave and run-up prediction in extreme conditions. Fast computing capacity (GPU) for forecasting and early warning.*	*SUEZ (RPT)*	SUEZ (RPT), UPPA, CAPB	South Aquitaine
#18	**2D wave runup and overtopping monitoring system (video/Lidar)**	*Increase reliability in complex coastal configurations. Increase of range and resolution.*	*UPPA*	UPPA, SUEZ (RPT), CAPB, AZT	South Aquitaine
#19	**Water management information systems**	*Enhanced spatial & temporal resolution water monitoring & management system, incl. fusion of satellite-based and in-situ data*	*VTT*	VTT, ALF, Burgas, RST-TTO	Nordic Archipelago, Burgas
#20	**Digital land use & planning tools to address impacts of UHI**	*Tools to predict & visualise climate impacts under user-defined planning & development scenarios, incl. socioeconomic impact*	*VTT*	VTT, ALF, SAPA, PL	Nordic Archipelago, Parnumaa

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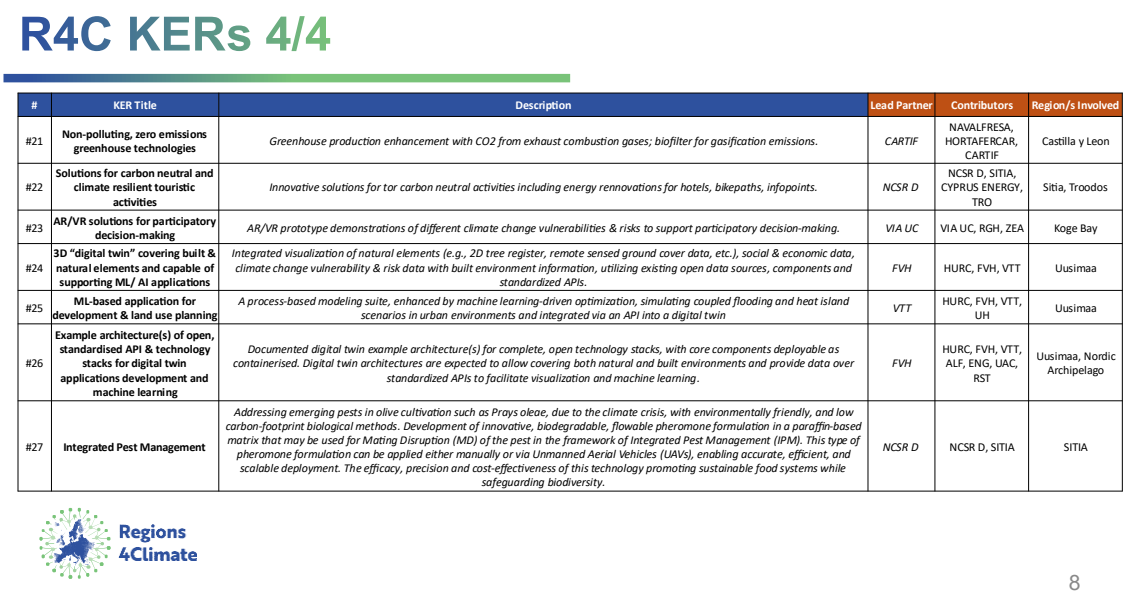
Figure 11. Third part of the list of R4C potential KERs. (Source: 2nd Exploitation Workshop)



R4C KERs 4/4

#	KER Title	Description	Lead Partner	Contributors	Region/s Involved
#21	Non-polluting, zero emissions greenhouse technologies	*Greenhouse production enhancement with CO2 from exhaust combustion gases; biofilter for gasification emissions.*	*CARTIF*	NAVALFRESA, HORTAFERCAR, CARTIF	Castilla y Leon
#22	Solutions for carbon neutral and climate resilient touristic activities	*Innovative solutions for tor carbon neutral activities including energy rennovations for hotels, bikepaths, infopoints.*	*NCSR D*	NCSR D, SITIA, CYPRUS ENERGY, TRO	Sitia, Troodos
#23	AR/VR solutions for participatory decision-making	*AR/VR prototype demonstrations of different climate change vulnerabilities & risks to support participatory decision-making.*	*VIA UC*	VIA UC, RGH, ZEA	Koge Bay
#24	3D "digital twin" covering built & natural elements and capable of supporting ML/ AI applications	*Integrated visualization of natural elements (e.g., 2D tree register, remote sensed ground cover data, etc.), social & economic data, climate change vulnerability & risk data with built environment information, utilizing existing open data sources, components and standardized APIs.*	*FVH*	HURC, FVH, VTT	Uusimaa
#25	ML-based application for development & land use planning	*A process-based modeling suite, enhanced by machine learning-driven optimization, simulating coupled flooding and heat island scenarios in urban environments and integrated via an API into a digital twin*	*VTT*	HURC, FVH, VTT, UH	Uusimaa
#26	Example architecture(s) of open, standardised API & technology stacks for digital twin applications development and machine learning	*Documented digital twin example architecture(s) for complete, open technology stacks, with core components deployable as containerised. Digital twin architectures are expected to allow covering both natural and built environments and provide data over standardized APIs to facilitate visualization and machine learning.*	*FVH*	HURC, FVH, VTT, ALF, ENG, UAC, RST	Uusimaa, Nordic Archipelago
#27	Integrated Pest Management	*Addressing emerging pests in olive cultivation such as Prays oleae, due to the climate crisis, with environmentally friendly, and low carbon-footprint biological methods. Development of innovative, biodegradable, flowable pheromone formulation in a paraffin-based matrix that may be used for Mating Disruption (MD) of the pest in the framework of Integrated Pest Management (IPM). This type of pheromone formulation can be applied either manually or via Unmanned Aerial Vehicles (UAVs), enabling accurate, efficient, and scalable deployment. The efficacy, precision and cost-effectiveness of this technology promoting sustainable food systems while safeguarding biodiversity.*	*NCSR D*	NCSR D, SITIA	SITIA

Regions 4Climate

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Figure 12. Fourth part of the list of R4C potential KERs. (Source: 2nd Exploitation Workshop)

The session opened with a recap of the R4C exploitable results, reaffirming the definition of project results as tangible or intangible outputs that can be used to generate scientific, societal, or economic impact. These include not only products and services but also methodologies, data, and knowledge that can support further research or innovation.

A comprehensive overview of the project's KERs was presented, covering a wide range of outputs across work packages. These included analytical frameworks, digital platforms, policy recommendations, innovation roadmaps, and technical solutions such as nature-based coastal restoration, digital twins, AR/VR tools for participatory planning, and integrated pest management systems. Each KER was described in terms of its content, lead partner, and regional relevance, highlighting the diversity and potential of R4C's innovation portfolio.

The core of the workshop focused on two strategic tools: the Business Model Canvas and the TRL9 Roadmap. The Business Model Canvas was introduced as a visual and systemic method for structuring the exploitation strategy of each KER. Participants were guided through its nine building blocks—value proposition, customer segments, channels, customer relationships, revenue streams, key resources, key activities, key partnerships, and cost structure. This framework enables partners to articulate how each result creates, delivers, and captures value, and to identify the conditions for its sustainability and scalability.

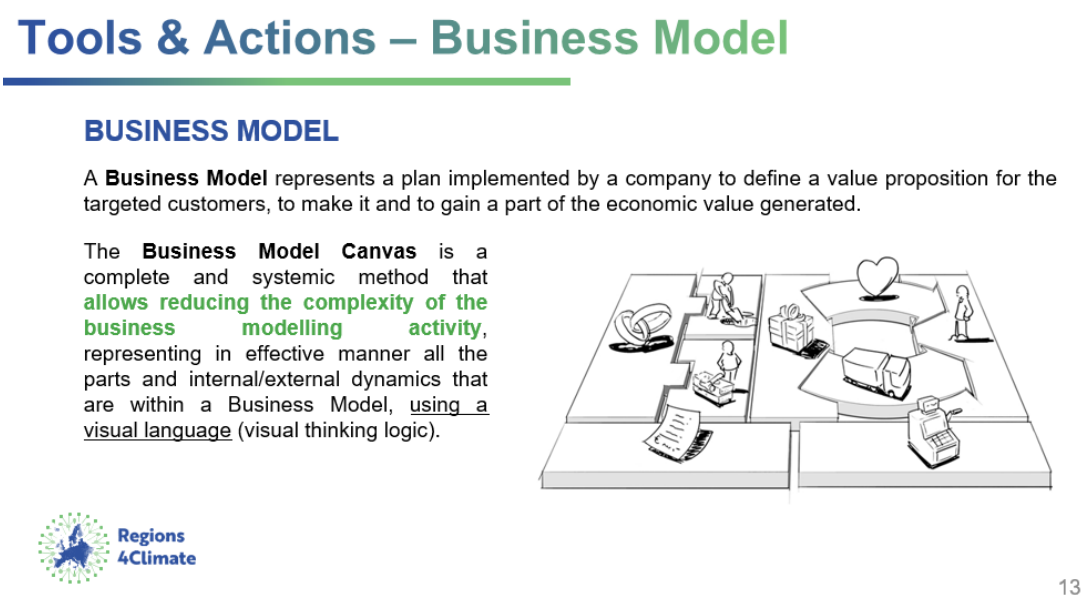

Figure 13. Definition of Business Model and Business Model Canvas. (Source: 2nd Exploitation Workshop)

In parallel, the TRL9 Roadmap was presented as a tool to assess the current and target Technology Readiness Levels of each KER. The roadmap helps partners identify the R&D activities required to reach full market maturity (TRL 9), estimate associated costs and timelines, and anticipate potential barriers and enablers. It also includes questions related to commercialization strategies and intellectual property protection, ensuring that each result is supported by a clear path to impact.

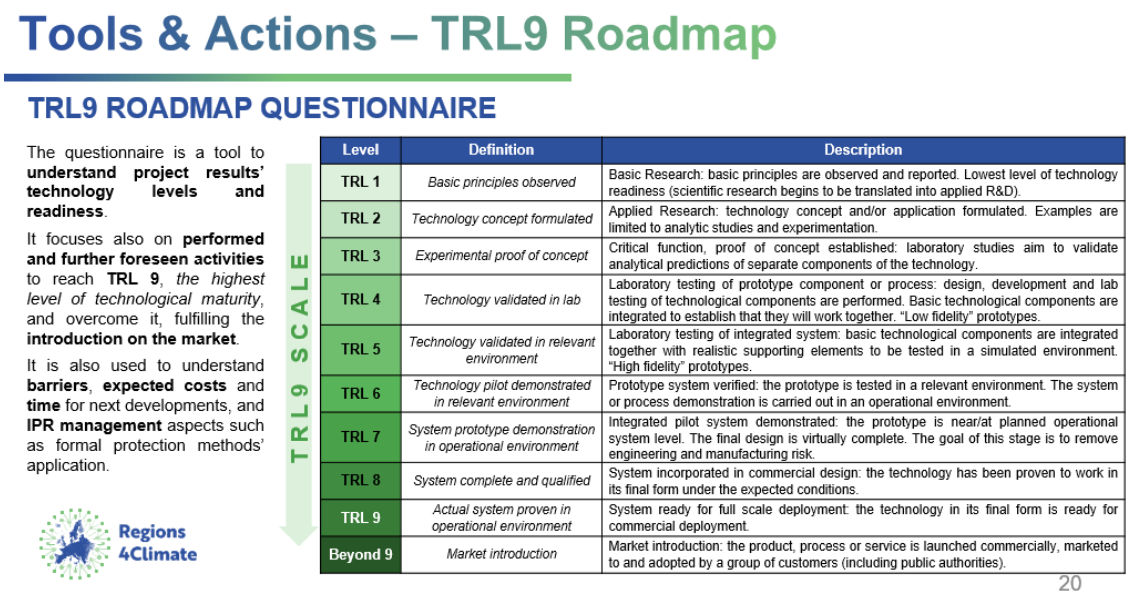

Figure 14. Definition of TRL9 Roadmap. (Source: 2nd Exploitation Workshop)

To support the prioritization of KERs, the workshop introduced a set of five key performance indicators: current TRL level, degree of innovation, strategic clarity (including market definition and customer identification), time to market, and stakeholder replication potential. These criteria will guide the selection of the most promising results for further business modelling and exploitation planning.

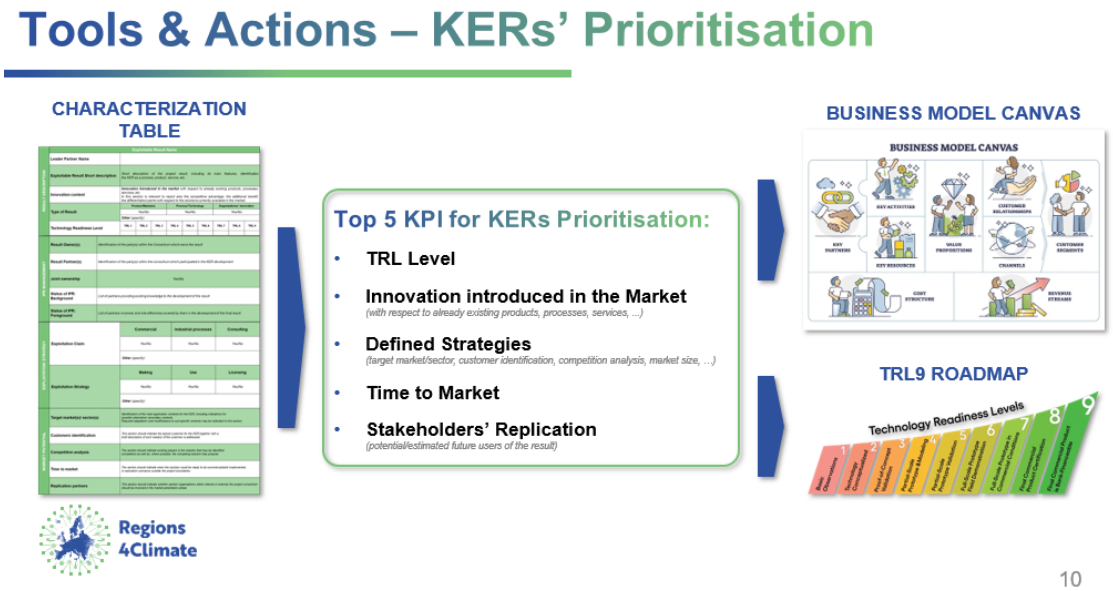

Figure 15. Prioritization Structure for Key Exploitable Results. (Source: 2nd Exploitation Workshop)

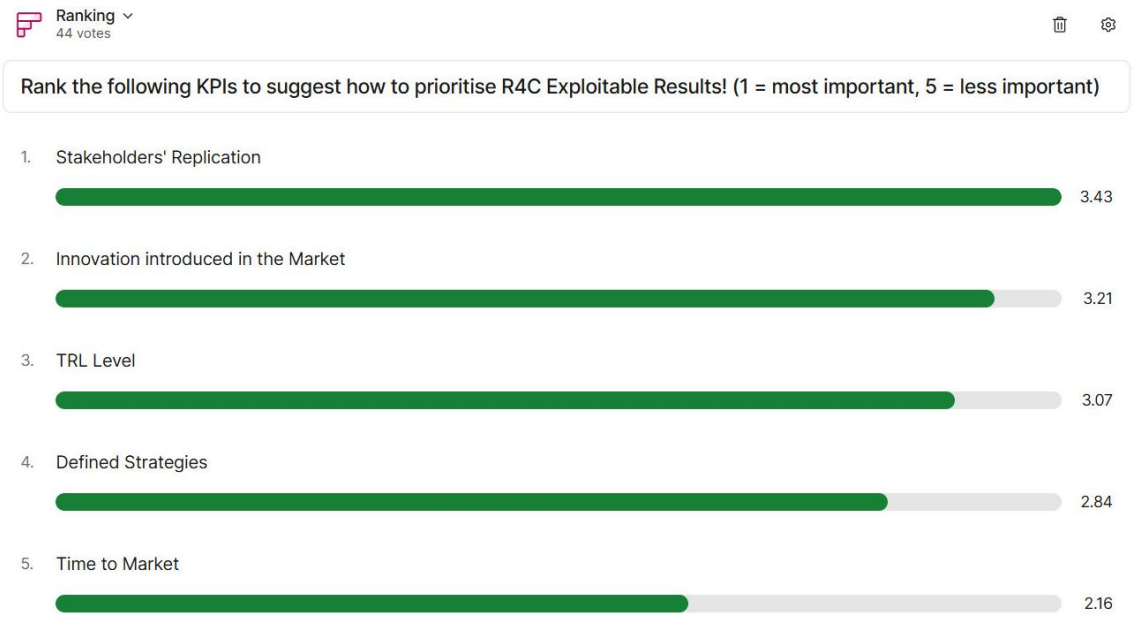

Figure 16. Results of the prioritization of KPIs. (Source: 2nd Exploitation Workshop)

The workshop concluded with a roadmap for the next steps. Before June 2025, partners will complete the Characterization Table for each KER, providing detailed information on innovation content, IPR status, exploitation strategy, and market context. This will be followed by the prioritization of KERs and the distribution of Business Model Canvas and TRL9 Roadmap questionnaires for the selected results.

In summary, the second R4C Exploitation Workshop provided a practical and strategic framework for advancing the exploitation of project results. By combining business modelling with technology readiness assessment, the workshop equipped partners with the tools needed to transform innovative ideas into sustainable, scalable solutions that can support climate resilience across Europe.

9. Potential Risks and Barriers to the Exploitation of KERs

The successful exploitation of Key Exploitable Results (KERs) within the Regions4Climate (R4C) project depends on a range of technical, organizational, legal, and market-related factors. While the project has developed a robust methodology and toolkit - including the Characterization Table, TRL9 Roadmap, and Business Model Canvas - several risks and barriers may hinder the full realization of the project's exploitation objectives.

From the above, we identified the following:

One of the main challenges identified concerns the complexity in distinguishing and classifying KERs. Specifically, differentiating between project deliverables, which are intended for dissemination, and project results, destined for exploitation, has proven to be difficult. This ambiguity can lead to delays in exploitation planning and may result in valuable outcomes being underutilized. To address this issue, the project has relied on structured tools such as the Characterization Table and dedicated workshops, which help clarify definitions, roles, and facilitate a more effective exploitation process.

Another significant challenge is the large number of results and the involvement of various stakeholders in each Key Exploitable Result. This complexity makes coordination difficult and increases the likelihood of inconsistent or incomplete exploitation strategies. To address this, the approach involves prioritizing KERs using clear Key Performance Indicators (KPIs) such as technology readiness level, degree of innovation, and potential for stakeholder replication to focus on the most impactful opportunities.

One more main challenge to be encountered relates to the management of Intellectual Property (IP). Issues such as ownership, joint development, and the expenses associated with protecting intellectual property can lead to disputes or delays in securing and exploiting project outcomes. To address these obstacles, the project has established clear procedures for the notification and protection of IP, with oversight provided by the Exploitation Manager and the General Assembly.

Another last important consideration is the economic sustainability of protecting Intellectual Property, particularly in cases where the results are not intended for commercialization. Applying formal protection to such outcomes might not be financially justified, potentially leading to an inefficient allocation of resources or leaving certain innovations unprotected. Therefore, IP protection is recommended only for those results that have clear commercial potential.

10. Conclusions

This deliverable marks a significant milestone in the Regions4Climate project's journey toward ensuring the long-term impact and sustainability of its climate resilience innovations. By developing tailored, region-specific sustainable business models and comprehensive exploitation plans, the project lays the groundwork for transforming research outputs into real-world solutions that are economically viable, socially inclusive, and environmentally responsible.

The methodologies and tools presented - such as the Business Model Canvas, the TRL9 Roadmap, and the Characterization Table - provide a structured approach to identifying, evaluating, and advancing Key Exploitable Results (KERs). These instruments not only support commercialization strategies but also foster stakeholder engagement, capacity building, and policy alignment across diverse regional contexts.

As the project progresses toward its final phase, the insights and frameworks outlined in this draft will be further refined and validated in collaboration with partners and stakeholders. The final version of this deliverable will incorporate updated exploitation strategies, finalized business models, and concrete action plans to ensure that R4C's innovations continue to deliver value well beyond the project's duration.

Ultimately, D6.4 contributes to the broader mission of enabling a just and resilient transition to climate adaptation across Europe, supporting regional innovation ecosystems and empowering communities to thrive in the face of climate challenges.

11. References

References will be written for the final version of the deliverable.

12. Annex

For the final version of the deliverable, in the Annex will be reported each interesting source of information elaborated for D6.4, such as Characterization Tables and other questionnaires provided by project's partners.