



MANAGING RESILIENT NEXUS SYSTEMS THROUGH PARTICIPATORY SYSTEMS DYNAMICS MODELLING

Deliverable 7.5 – Exploitation and sustainability plan. First Version.

WP7 – Pathways to Impact

www.rexusproject.eu

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from
Nexus **Thinking** to
Nexus **Doing**



Deliverable 7.5

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List of Abbreviations

| Abbreviation | Definition |
|--------------|-----------------------------|
| BLS | Bureau of Labor Statistics |
| CA | Consortium Agreement |
| CAGR | Compound Annual Growth Rate |
| DO | Domain Objectives |

| | |
|--------|--|
| EbA | Ecosystem based Approaches |
| ECS | Environmental Consulting Services |
| EO | Earth Observation |
| ES | Ecosystem Services |
| E&S | Exploitation and Sustainability |
| EU | European Union |
| GA | Grand Agreement |
| GFCs | Global Framework for Climate Services |
| GHG | Greenhouse gases |
| HRB | Horizon Results Booster |
| IP | Intellectual Property |
| IPR | Intellectual Property Rights |
| IUCN | International Union for Conservation of Nature |
| JV | Joint Ventures |
| LAA | Learning and Action Alliances |
| LCA | Life Cycle Assessment |
| MITECO | Ministry for the Ecological Transition and the Demographic Challenge |
| NBS | Nature based Solutions |
| NDA | Non-disclosure Agreement |

| | |
|-------|--|
| NGO | Non-Governmental Organisation |
| NIs | Nexus Indicators |
| NRQ | Nexus Resilience Qualities |
| PO | Parent Organisation |
| PSDM | Participatory System Dynamics Modeling |
| PSM | Participatory Social Mapping |
| R&D | Research and Development |
| R&I | Research and Innovation |
| SDG | Sustainable Development Goals |
| SDM | System Dynamics Modeling |
| SNA | Social Network Analysis |
| WEF | Water-Energy-Food |
| WEFC | Water-Energy-Food-Climate |
| WEFE | Water-Energy-Food-Ecosystem |
| WFD | Water Framework Directive |
| W-L-E | Water-Land-Energy |
| WP | Work Package |

Introduction

The Water-Energy-Food (WEF) Nexus is central to sustainable development. Demand for all three sectors is increasing, driven by a rising global population, rapid urbanization, changing diets and economic growth. Agriculture is the largest consumer of the world's freshwater resources, and more than one-quarter of the energy used globally is expended on food production and supply. The inextricable linkages between these critical sectors require a suitably integrated approach to ensuring water and food security, and sustainable agriculture and energy production worldwide (FAO, 2011; 2020, UN, 2014).

In this context, REXUS project jointly develops and validates knowledge and tools that facilitate the transition from the stage of "Nexus Understanding" to "Nexus Doing", in order to enhance resilience. Additionally, REXUS explores the appropriateness of existing governance structures, as well as the policy and legal frameworks for addressing the key specificity of the Nexus approach, namely the need for cross-sectoral, cross-scale and stakeholder integration. The project relies on a methodology named "Learning and Action Alliances (LAA)", for multi-stakeholder engagement, in order to develop the Participatory System Dynamics Models (PSDMs), which allow the stakeholders to understand WEFC interactions and propose evidence-based policy making. This methodology also promotes synergies across sectors, such as nature-based solutions (NBS) to climate change adaptation (i.e. EbA) and mitigation. Some additional results that the project provides are the development of a coupled-resource flow management tool and EO-based suitability tools for Nexus management, as well as climate risk assessments analysis for the pilot cases, in order to understand how climate might affect different WEF configurations. Finally, the project assesses socio-economic implications of all the above actions.

For all these actions, five pilot areas have been selected to represent a wide spectrum of European and global Nexus situations, potentials, and implementation conditions. They span scales from sub-catchment (Pinios river basin, Greece; Lower Danube river basin, Romania-Serbia-Bulgaria) to tributary catchment (Nima river, Colombia) to full catchment (Isonzo-Soča river basin, Italy/Slovenia) and to national territory (peninsular Spain).

To maximize the impact of REXUS beyond the duration of the project and across scales beyond the project partnership, WP7 "Pathways to Impact" is foreseen. The current report is developed in the framework of Task 7.4 which focuses on the exploitation and sustainability of the REXUS results after the end of the project and on the development of mechanisms for the replication and adaptation of REXUS features at other geographical territories (e.g. sub-catchments/catchments) and countries. Finally, in the framework of the Task 7.4, a business plan is foreseen to ensure the long-term sustainability, commercialization and uptake of its results and products, as well as to address legal and security aspects. Task 7.4 was launched from the beginning of the project and is planned to be completed by the project end. The current report is the first version of the "Exploitation and Sustainability Plan" (Deliverable 7.5) while the final version will be submitted by the end of the project.

1.1 Scope

Exploitation and sustainability (E&S) are key factors of a project due to the fact that they highly contribute to the achievement of the expected impacts of the project over time, in particular beyond the duration of a project. The pathway to impact begins with the generation of the project results, to their dissemination and exploitation, contributing to the expected outcomes of a project's framework, and ultimately to the wider scientific, economic and societal impacts of the project destination (European Commission, 2021).

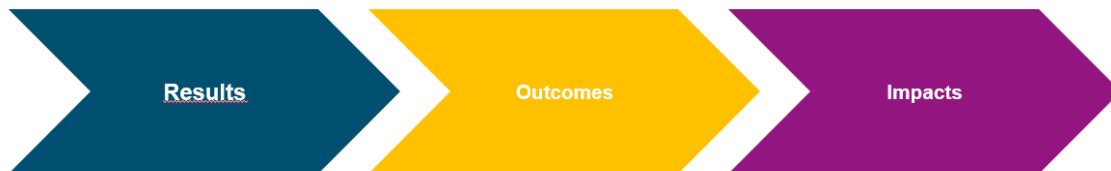


Figure 1: Steps towards the achievement of the expected impacts

At this point, it is considered important to clarify the key terms dealt within this report, that is project results, exploitation and sustainability.

The term **Result** refers to any tangible or intangible effect of the action, such as data, know-how or information, whatever its form or nature, whether or not it can be protected, as well as any Intellectual Property rights attached to it (European Commission, 2022). It is of the utmost importance that, since the primary focus is on the exploitation of these results, the document's concentration is on those with the highest potential for exploitation, thus creating the biggest impact, the so-called **key results** (European Commission, 2021). Key results can be used and create impact, not only by the project partners but by other stakeholders as well. Moreover, these project results can be reusable and exploitable (e.g. inventions, prototypes, services) as such, or become elements (knowledge, technology, processes, networks) that have potential to contribute for further work on research or innovation (European Commission, 2021).

As far as exploitation is concerned, this refers to the use of results in further research and innovation activities other than those covered by the project's action that generated the results (European Commission, 2022). Its objective is to effectively use project results through scientific, economic, political or societal exploitation routes aiming to turn Research and Innovation (R&I) actions into value and impact for society, whilst it focuses on making concrete use of research results (European Commission, 2021). Exploitation could potentially lead to new legislation and recommendations, or help tackle a specific problem. It could also respond to an existing demand, or even cause significant impact on the economy, the society and even the innovation domain (European Commission, 2021). Exploitation is differentiated from dissemination as, according to the IPR Helpdesk (European Commission, 2022), the latter refers to the public disclosure of the results by appropriate means, other than resulting from protecting or exploiting the project outputs.

The exploitation pathways may be categorized into two main types, the **commercial** and the **non-commercial** ones. The former could include developing, creating, manufacturing and marketing a product or process, or creating and providing a service. A project result that would be used in standardisation activities would fall under the commercial exploitation type as well. On the other hand, non-commercial exploitation includes among others, the use of a project result for policy-making, educational purposes and most importantly in further research and innovation activities outside the project, from where the result originates.

The second integral part of this deliverable is related to the plan for the sustainability of the project results after the project end. Considering that there is no official definition of sustainability provided by the European IPR

Helpdesk, for the purpose of this deliverable, sustainability actions refer to the following (European Commission, 2014):

- The implementation and/or continuation of a project result at the project's pilot areas, e.g. application of strategies, plans, roadmaps etc.
- Actions related to the continuation of a project task or the maintenance of a result after the end of the project, e.g. maintenance/updating of the project website, tool, platform
- Dissemination activities taking place after the project end, e.g. transfer of knowledge through publications of project outputs at scientific magazines, presentation of project results at targeted conferences, etc.

1.2 Structure of the deliverable

This deliverable is structured upon four main sections which are described following.

Section 1 "Introduction" which is actually the current section, includes a small introduction to the objective of the project and of the specific project task and deliverable, while the specific scope of the report is detailed afterwards where definitions of the key terms used and clarifications are provided.

Section 2 "Methodological framework" presents the approach that was adopted for the development of the Exploitation and Sustainability Plan, both with respect to the first version and the final version of the Plan, as well as the strategy for the collection of input from the REXUS partners, including the questionnaire that was developed specifically for this purpose. In addition, reference is being made to the Horizon Booster service that the project received in this phase.

Section 3 "Exploitation plan" begins with a presentation of the project exploitable results as these were identified by the project partners. It also includes information with respect to the background and foreground intellectual property of the REXUS partners and the ownership of the exploitable results, with the aim to identify potential barriers or conflicts for exploitation. Furthermore, a brief market analysis is performed focusing on the main markets identified by the REXUS partners for the exploitable results. The relevant customers and/or end-users of the REXUS' results, as well as the competitive solutions and the barriers to exploitation are also presented.

Section 4 "Sustainability plan" firstly presents the intentions of the pilot leaders to implement the project results at the pilot areas, including the description of the identified results, their main end-users and the benefits provided, the identified barriers, as well as the necessary activities and time frame. Following, the intentions of the project partners to continue/maintain and disseminate their results, as well as the respective means of dissemination, the necessary resources and time frame are recorded.

2 Methodological framework

This section focuses on the overall methodology that was followed for the development of REXUS' Exploitation and sustainability plan. It elaborates on the general approach of this document as well as on the process for the collection of input from the project partners.

2.1 Approach

The methodology for elaborating the Exploitation and Sustainability plan is structured upon two phases, the first one taking place during the first year of the project, and the second one continuing until the end of the project. In specific, the aim of the first phase is that the partners identify the issues that need to be further addressed in the course of the project (e.g. Intellectual Property ownership of results, existence of relevant markets, barriers for exploitation, etc.). On the other hand, the aim of the second phase is to detail by the end of the project, a well-grounded plan on the partners' final intentions for exploitation and sustainability of the project results. Considering that by the end of the first phase, the project would still run at its early stages, it is not expected that the partners will have a clear view of all issues, so it is logical that during the second phase an update of all initial statements will also take place. The first phase is described in the draft Exploitation and sustainability plan (current document), while the second phase will be included in the final exploitation and sustainability plan.

Since exploitation and sustainability are discrete terms, it was considered appropriate that a differentiated approach is established for the development of the plan in each case. This is further elaborated in the following sections.

2.1.1 Exploitation plan

With respect to the plan for the exploitation of the project results, the overall methodology that was followed is mainly based on the publication of the EU IPR Helpdesk "Making the most of your H2020 project: boosting the impact of your project through effective communication, dissemination and exploitation" (European Commission, 2019a). In brief, the methodology for the exploitation plan is built on the following steps:

- Identification and characterization of project exploitable results
- Review of Intellectual Property issues
- Selection of appropriate exploitation routes
- Investigation of relevant markets and target end-users and customers
- Screening of potential barriers
- Description of necessary activities for achieving exploitation

The first step of the exploitation plan refers to the identification and mapping of the key exploitable results of the project. In this respect, the value proposition related to the exploitable results of the project partners, their innovative aspect, their importance, the main use and any alternative uses that the results could have, as well as their targeted stakeholder groups and needs are identified from the early stages of the project. Towards its later stages and as more information becomes available, an update regarding the aforementioned aspects takes place. It is not also uncommon that some project partners might lose interest in exploiting certain results, or abandon a venture that they have previously started.

The second step focuses on the investigation of the Intellectual Property (IP) issues, such as the background and foreground IP related to the identified exploitable results. The ownership of the exploitable results is examined, as in the case that more than one project partners are associated to the development of an exploitable result, a joint ownership would arise. It is also important to start exploring from the early stages of the project, the interest of project partners to protect their foreground IP with some means of IP protection (IP rights). This step is crucial

for exploring the potential for any conflict or barrier for exploitation that should be treated with particular attention. The specific means of foreground IP protection, as well as the way a jointly owned result would be exploited by its different owners will be dealt during the later stages of the project.

The third step includes the identification of the exploitation route of the exploitable results, by firstly applying a coarse differentiation between commercial exploitation and non-commercial exploitation (e.g. for policy making, further research, etc.). In addition, the project partners are informed with respect to the available exploitation channels, so that they start exploring which is more suitable and feasible for their case. As the project progresses, the project partners are asked to identify the specific exploitation channels for their exploitable results.

The fourth step refers to the identification of the markets for the identified exploitable outputs and to the analysis of the market potential. The latter includes the identification of the main customers or/and end-users of the exploitable results, an analysis of their needs and requirements and whether they are met by the project results, as well as the investigation of potential competitors. As soon as these are addressed, the project partners may tailor their exploitable results so as to better match market needs and to be more competitive.

The fifth step of the exploitation plan focuses on the identification of the potential barriers for the exploitation of the results. While in the first phase, a preliminary listing takes place, the project partners will later provide a thorough analysis of the barriers and will try to explore the potential measures for overcoming them.

The last step for the development of the exploitation plan is foreseen to take place only at the later stages of the project, when all the previous steps are completed. In specific, during the last step the necessary activities for ensuring the exploitation of the project results after the project end, are detailed.

Figure 2 below, summarizes the steps for the development of the Exploitation plan.

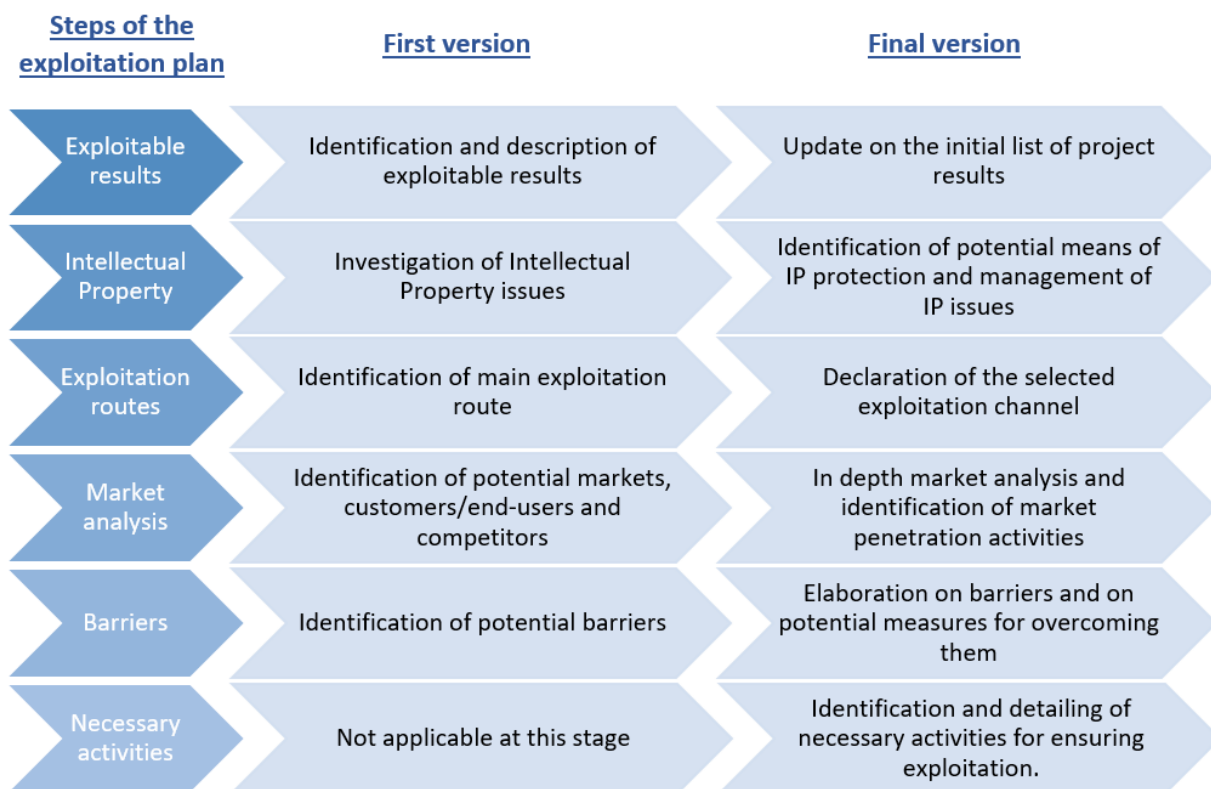


Figure 2: Steps for the development of the Exploitation plan

It is worth noting that in the framework of the first version of REXUS Exploitation plan, the Horizon Results Booster (HRB) service of the European Commission was used. More specifically, REXUS applied for the service “Module A: Identifying and creating the portfolio of R&I project results” which supports projects to create a portfolio of results for future joint dissemination actions, as well as a mapping of target stakeholders. As this service is available for project groups only, REXUS participated as part of a project group focusing on the Water-Food-Energy-Ecosystem nexus. The main added value of this service for the REXUS Exploitation plan is that it provided an advanced insight on the project target stakeholders as well as on the most common barriers for the exploitation of the results of such projects.

Regarding the second phase of REXUS Exploitation plan, it is planned to make use of the services provided by “Module C: Assisting projects to improve their existing exploitation strategy”. In specific, this service provides assistance in the following aspects:

- review of the key exploitable results of the project;
- revise, complement and clarify existing exploitation plans of project results and/or outline exploitation paths of results;
- techniques to identify all relevant stakeholders in the exploitation value chain;
- support the performance of a risk analysis related to the exploitation of results.

As a result, it is expected that REXUS will have a more thorough yet focused and effective exploitation strategy that would ultimately lead to the maximization of its impact.

2.1.2 Sustainability plan

For the Sustainability plan, the respective methodological steps are as follows:

- Identification of project results for which there is interest for implementation/ continuation/maintenance and/or further dissemination after the project end
- Review of Intellectual Property issues
- Identification of target end users or target audience
- Selection of appropriate means
- Screening of potential barriers
- Description of necessary activities for ensuring sustainability

The first step of the Sustainability plan refers to the identification and mapping of those project results for which there is interest for implementation/ continuation/maintenance and/or further dissemination after the project end. Towards the later stages of the project and as more information becomes available, an update regarding the interests of the project partners on the issue should take place. It is not also uncommon that some project partners might lose interest in sustaining certain results or gain interest in sustaining other project results.

The second step focuses on the investigation of the Intellectual Property (IP) issues, such as the background and foreground IP, the IP rights as well as the ownership of the identified results that will be sustained. This step is crucial for exploring the potential for any conflict or barrier for ensuring sustainability that should be treated with particular attention. The specific mode under which any barriers or conflicts would be overcome, will be dealt during the later stages of the project.

The third step refers to the identification of the target audience and/or end-users of the project results. At the later stages, the partners will be asked to define the specific end-users that will be contacted.

The fourth step includes the identification of the means for promoting the sustainability of the project results. As the project progresses, the project partners will be asked to further specify the communication and dissemination channels (e.g. specific events) and means, based on the needs of their target users and audience.

The fifth step focuses on the identification of the potential barriers for the sustainability of the results. While in the first phase, a first listing of them takes place, during the later stages the project partners will provide a more thorough analysis of the barriers and will try to explore the potential measures for overcoming them.

The last step for the development of the sustainability plan includes the identification of the necessary activities and resources for ensuring sustainability. While in the first phase, a first indication is requested, during the later stages the project partners will provide a more detailed analysis of these activities.

Following, Figure 3 summarizes the steps for the development of the Sustainability plan.

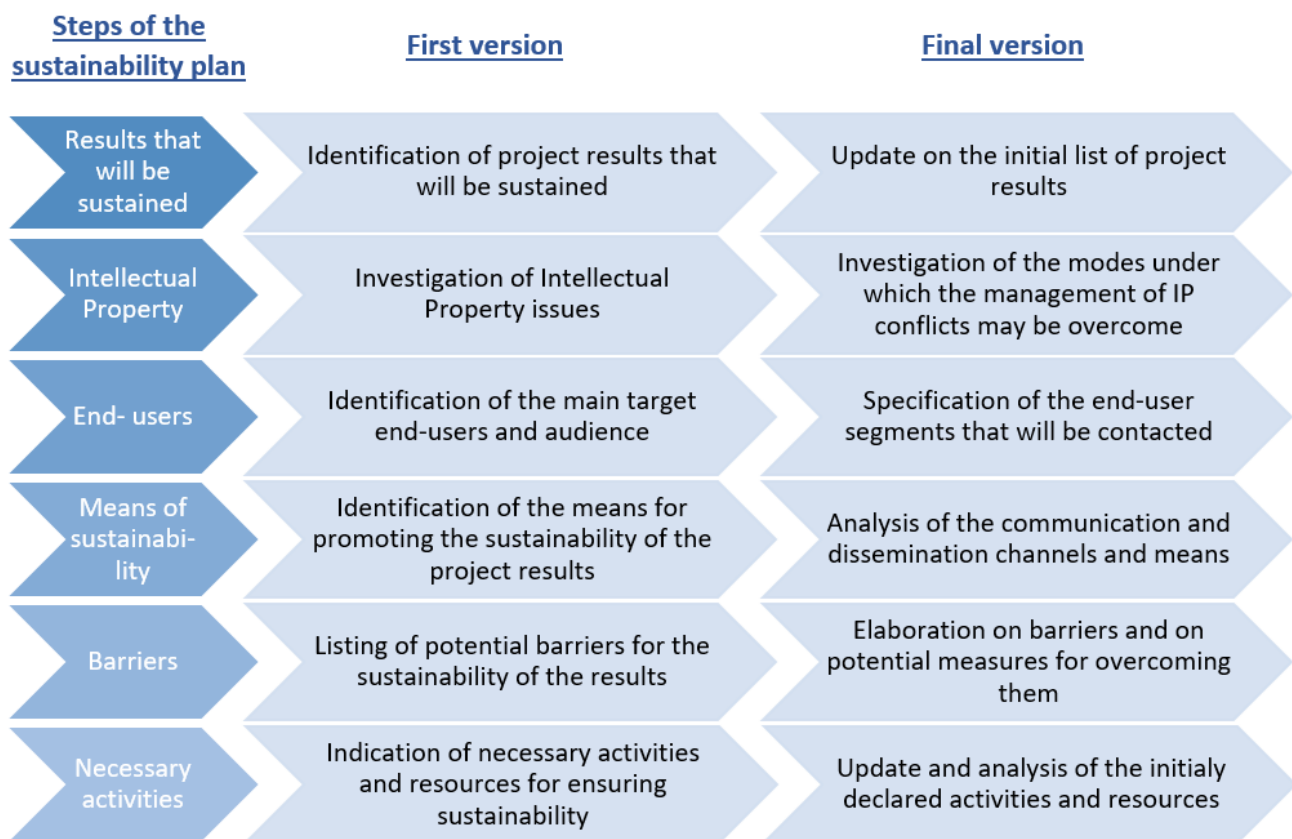


Figure 3: Steps for the development of the Sustainability plan

2.2 Strategy for capturing input

The strategy that was followed for gathering the input regarding the exploitation and sustainability plans from the REXUS partners is also broken in two phases in line with the methodology presented previously.

First phase

During the first phase a webinar was firstly organized in order (i) to present the methodological approach for the Exploitation and sustainability plan, (ii) to clarify the definitions of the key terms used in order to achieve a

common understanding between partners, as well as (iii) to present the questionnaire developed for capturing the necessary input from partners.

The purpose of this questionnaire was to map all project results generated by the REXUS partners in order to estimate the potential for exploitation and to design appropriate exploitation pathways, as well as to ensure the sustainability of non-exploitable results. The questions were mainly multiple choice with a set of predefined answers, as well as open-ended questions in the cases that more specific input was required. The questionnaire was sent to the REXUS partners to be filled out. Then the input received was evaluated and if any clarifications or alignment to the established methodology was needed, the partners were contacted for additional feedback via e-mails or to arrange a specific meeting.

Figure 4 depicts the strategy of the first phase of input collection.



Figure 4: First phase of input collection

The E&S questionnaire is presented in detail hereafter. It consists of three Sections, in particular:

- Section 1: Contact information of the respondent.
- Section 2: Exploitation questionnaire. This Section is devoted to those project results that have potential for exploitation for commercial, societal and political purposes.
- Section 3: Sustainability questionnaire. Section 3 deals with non-exploitable results and includes questions relevant to:
 1. Section 3A: The implementation and continuation of the project results at the pilot areas (to be filled by the pilot partners)
 2. Section 3B: The dissemination of the project results after the project end.
- Glossary: Definitions of key terms such as Exploitation, Dissemination, Sustainability, Intellectual Property, etc.

Section 1 refers to the information of the respondent and the partners are asked to declare the name of the organization they represent, their full name and an e-mail.

| RESPONDENT INFO | |
|------------------|--|
| Organization | |
| Name and surname | |
| e-mail | |

Figure 5: Contact information of the respondent. REXUS E & S questionnaire, Section 1

In Section 2 “Exploitation”, the respondent is asked to provide information with respect to the exploitable results of his/her organization (i.e. title, brief description, added value), the ownership and protection of the results (i.e. background, foreground, ownership of each result, intended IPR) and the market (i.e. potential markets, end users, competitive solutions, barriers).

| EXPLOITATION | INPUT FROM PARTNER X | |
|--|--|-----------------------------------|
| Identification of exploitable results | | |
| Does any <u>project result</u> , connected to the activities of your organization in the project, have potential for <u>exploitation</u> ? | Please select | |
| If yes, how many exploitable results can you identify? | Please select | |
| If no, please explain why. | | |
| | Exploitable result No 1 (Title) | |
| Description of exploitable results | | |
| Please select among the available exploitable result types, the one that best matches your exploitable result. | N/R | If other, please briefly explain: |
| Please provide a title and a short description of your exploitable result, including its main features and <u>value proposition</u> . | Title: Short Description | |
| What is the intended type of exploitation (e.g. commercial, non-commercial). If other, please briefly explain. | Please select | If other, please briefly explain: |

Figure 6: Identification and description of exploitable results. REXUS E & S questionnaire, Section 2

| | | |
|--|---------------|--------------------------|
| Ownership and protection of the results | | |
| Is there any <u>background Intellectual Property (IP)</u> related to the exploitable result? If yes, | Please select | |
| a. Please describe background IP | | |
| b. Is your background IP protected with some form of Intellectual Property Right (IPR)? | | |
| c. If yes please indicate how | Please select | If other please specify: |
| Are you the <u>exclusive owner</u> of the exploitable result? | Please select | |
| If no, please name the other partner(s) that are owner(s) of this result. | | |
| Do you intend to protect your result with some form of Intellectual Property Right (IPR)? | Please select | |
| If yes, please specify how. | Please select | If other please specify: |

Figure 7: Intellectual Property issues. REXUS E & S questionnaire, Section 2

| | | |
|---|---------------|--|
| Market Research | | |
| Have you identified the potential market(s) of your result? If yes, please specify. | Please select | If yes please specify: |
| Who are the main potential <u>customers</u> and/or <u>end-users</u> who could be interested in this result? Please describe in more detail. | Please select | If more than one, please indicate: Please describe your selected options: |
| Are there any competitive solutions to your result? Please describe (including pros and cons compared to your result). | Please select | Please describe: |
| Are there any barriers to the uptake of your result? | | Please elaborate: |

Figure 8: Market analysis aspects. REXUS E & S questionnaire, Section 2

Section 3A “Sustainability: pilots”, deals with non-exploitable results and is focused on the implementation and continuation of the project results at the pilot areas (i.e. ultimate aim, stakeholders, barriers, necessary activities, resources needed, etc.).

| SUSTAINABILITY: PILOTS | INPUT FROM PARTNER X | |
|---|---|------------------|
| Which project result is aimed to be implemented/maintained at your pilot area after the project end? Please provide a description. | Please provide exact title and number of the Deliverable: Description: | |
| Are there any other partners that should be involved in the implementation of this project result after the project end? Please explain briefly their contribution/role. | Partners: | |
| Which is your pilot area? | Please select | |
| What is the ultimate aim of the implementation/continuation of this project result at your pilot area? | Please describe: | |
| Who are the main stakeholders who could exploit/benefit from the implementation of the project result? | Please select | Please describe: |
| What are the benefits for the stakeholders/end-users, environment, local economy & society from the implementation of the project result at the pilot area? | | |
| Are there any rules/regulations that you will have to abide by for the implementation of the project result at your pilot area? Have you identified any other obstacles/barriers? | Please describe: | |
| Sustainability Actions | | |
| What are the necessary activities for the implementation of the project result at your pilot area after the project end? | Please describe: | |
| What is the estimated time period necessary for implementing these activities? | Please select | |

Figure 9: Continuation of project results at pilot areas. REXUS E & S questionnaire, Section 3A

Section 3B tackles the dissemination of the project results after the project end that would ultimately aid in the project’s sustainability (activities, years of dissemination, necessary resources, etc.).

| SUSTAINABILITY: OTHER | INPUT FROM PARTNER X | |
|---|--|-------------------------|
| Have you identified any project activities for which you are responsible during the project, that could/will be continued/maintained after the project end? | Please select | |
| If yes, please provide the exact title and number of the relevant project task and outputs (deliverable). | Task title and number: Title and number of deliverable: | |
| What are the necessary activities for the continuation/maintenance of the project task after the project end? | | |
| For how long will you implement these activities? | Please select | If more please specify: |
| What are the resources that you will need for continuing/maintaining the project activity after the project end? | Please specify | |

Figure 10: Future dissemination of project results. REXUS E & S questionnaire, Section 3B

Second phase

The second phase of the strategy for the collection of input from partners is planned to start with a workshop targeting all the consortium members. During this workshop, each project partner will briefly present their result(s) with the aim to highlight any updates from the first phase. These changes could refer to the identified results, the selected exploitation pathways, IP management issues, etc. Once all the relevant project outputs are finalized, potential collaboration schemes between partners whose results seem to present synergies, may be suggested. These joint ventures, will be finalized, if so, through individual or group meetings with the appropriate partners. Following that, a more thorough form of the REXUS E&S questionnaire will be sent to all the consortium members, who will fill and send it back. The input received will be then evaluated and feedback will be requested where necessary.

Figure 11 summarizes the strategy of the second phase of input collection.



Figure 11: Second phase of input collection

3 Exploitation plan

This section focuses on the exploitation of the project results that will be generated in the framework of the REXUS project. In specific, the exploitable results are firstly categorized and then the input provided by the project partners with respect to the description of their exploitable results, the relevant IP issues and the market potential, are detailed. Lastly, a brief presentation of the available exploitation pathways is given.

3.1 Exploitable results

To allow for a better characterization and grouping of the project results, the project results have been grouped into 8 distinct categories, as shown in Figure 12:

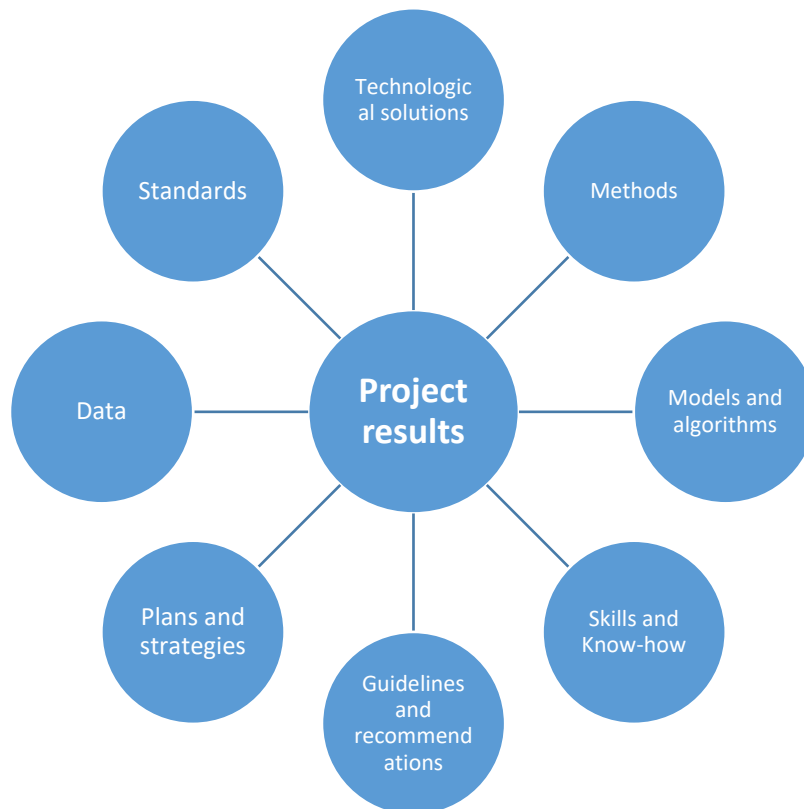


Figure 12: Categories of project results

Following, the input of the project partners with respect to the REXUS exploitable results is presented (Section 2 of the questionnaire). In Table 1, the input is summarized providing information with respect to the number of project results that each partner aims to exploit, the result type and the preferred exploitation type.

Table 1: Summary of partners input on exploitation

| Project partners | Number of results | Result type | Exploitation type |
|------------------|-------------------|---|-------------------|
| IRSA | 3 | Methods; Guidelines and recommendations | Non-Commercial |

| Project partners | Number of results | Result type | Exploitation type |
|------------------|-------------------|--|-------------------|
| ICATALIST | 1 | Methods | Commercial |
| UNIPD | 1 | Methods | Non-Commercial |
| CIRCE | 1 | Skills and know-how | Non-Commercial |
| AGRISAT | 1 | Methods | Commercial |
| ETIFOR SRL | 1 | Methods | Non-Commercial |
| UCAM | 3 | Methods/Models and algorithms; Methods/Plans and strategies; Guidelines and recommendations/Skills and know how | Non-Commercial |
| UCLM | 3 | Skills and know-how | Non-Commercial |
| SWRI | 2 | Skills and know-how; Guidelines and recommendations | Commercial |
| WCMC | 2 | Guidelines and recommendations | Non-Commercial |
| DRAXIS | 1 | Skills and know-how | Non-Commercial |

As it may be seen in the table above, the total number of project results identified to have potential for exploitation is nineteen. In addition, eleven project partners have identified one or more exploitable results (69% of project partners), while the average number of identified exploitable results per partner is two. With respect to the exploitable results, 74% (14) of them are foreseen to be exploited in a non-commercial way by their respective owners, while 26% (5) of them are planned to be commercially exploited. The main result types that were identified were “Methods” (42%), “Skills and know-how” (32%) and “Guidelines and recommendations” (26%). It is worth noting that some of the results were classified in more than one category.

3.1.1 Methods

This sub-section focuses on the exploitable results that were classified by the consortium members as “**Methods**”, i.e.:

- Nexus-related indicators (IRSA)
- PSDM framework (IRSA)
- Visioning for resilient nexus (ICATALIST)
- Socio-economic impacts of WEF Nexus-related ES (UNIPD)
- Pilot implementation set-up: Baseline, framework, benchmarking (AGRISAT)
- Roadmap to identify the potential role of Nature-based solutions for a climate resilient WEF nexus (ETIFOR SRL)
- Coupled resource stock-flow systems model (UCAM)
- WEF-nexus decision-making on progress towards wider SDG delivery (UCAM)

The REXUS “Methods” are analyzed below, based on the input provided by the partners.

| Nexus-related indicators | |
|--------------------------------------|---|
| Declared by: | IRSA |
| Relevant WP/Task/Deliverable: | WP4, Task 4.1, D4.1 “Report on PSM and SNA. Identification of DOs, NRQs and Nis”. |
| Exploitation type: | Non-commercial. |
| Short description: | Not available. |
| Main features: | A review of existing indicators related to the WEFC Nexus will be provided, and participatory activities will be oriented to identify the most relevant ones for specific pilots (and group of stakeholders). |
| Objectives: | To identify suitable indicators for the description of pilot state and potential evolution in different scenarios. |
| Value proposition: | It can be used by policy- and decision-makers for system assessment and analysis, for supporting a strategic analysis and visioning of the system under investigation. |
| Advantages: | Available indicators, well established in the scientific literature, will be selected (and if needed, edited and customized) based on a bottom-up participatory process. The identification of groups of indicators (Domain Objectives, Nexus Indicators, Nexus Resilience Qualities) will help simply characterizing system state and evolution. |
| Main use: | By regional, national competent authorities for policy- and decision- making. |
| Alternative uses: | By researchers for supporting the comparison of Nexus systems. |
| What is new: | Mainly the process based on the combination of a review of existing indicators and the bottom-up participatory selection (and potentially, characterization) and weighting of the most suitable/relevant ones for the analysis of a specific Nexus system. |
| Why it is important: | Although keeping track of the complexity of Nexus systems is crucial, indicators provide a synthetic overview and a straightforward characterization of the main aspects related to sectoral issues and of the impacts of sectoral interconnection. |
| What needs does it meet: | The need to make informed decisions, based on a reasonable and structured simplification of the complexity of Nexus systems. |

| PSDM framework | |
|--------------------------------------|--|
| Declared by: | IRSA |
| Relevant WP/Task/Deliverable: | WP4, Task 4.2, D4.2 “Framework for PSDM implementation in REXUS case studies”. |

| | |
|---------------------------------|--|
| Exploitation type: | Non-commercial. |
| Short description: | Not available. |
| Main features: | Based on the multiple experiences carried out in different pilots, a common framework for PSDM building will be provided. Particular attention will be given to the methodological approach to combine scientific knowledge (e.g. from baseline description) and stakeholders' knowledge (from interviews and group exercises). |
| Objectives: | Develop a common approach for PSDM building and implementation in Nexus systems and, potentially, a common model (or sub-models) structure. |
| Value proposition: | It can be used mainly by researchers, scientists and practitioners to develop PSDM for Nexus systems. It can ultimately support scenario analysis and strategic planning. |
| Advantages: | PSDM is not straightforward and challenging in particular as far as the integration between scientific and local/expert knowledge is concerned. Therefore providing a simple framework can help setting a standardized approach to the analysis of Nexus systems, based on a strongly participatory approach, and a comprehensive assessment of the multiple impacts of sectoral policies. |
| Main use: | By researchers, scientists, practitioners to support policy- and decision-makers, and in direct cooperation with a wide range of stakeholders. |
| Alternative uses: | By researchers and scientists to map complex Nexus Systems. |
| What is new: | Although there are some experiences with SDM for Nexus systems analysis, the main elements of innovation are the explicit inclusion of the Participatory component in a structured framework and the direct connection of PSDM structure with indicators (and particularly SDGs). |
| Why it is important: | Providing a common ground/approach to PSDM in Nexus Systems is a key opportunity to support decision- and policy-makers worldwide in understanding the impacts of policy choices and the sustainability of Nexus systems on the long term. |
| What needs does it meet: | The need to make informed-decisions, based on a structured and replicable approach/process. |

Visioning for resilient nexus

| | |
|--------------------------------------|--|
| Declared by: | ICATALIST |
| Relevant WP/Task/Deliverable: | WP2, Task 2.6, D2.8 "Report on transition pathways for REsilience neXUS in pilot areas". |
| Exploitation type: | Commercial. |
| Short description: | Not available. |
| Main features: | A participatory scenario planning is being designed as a broad participatory process whose central aim of is to engage a representative group of stakeholders around WEFC Nexus. |

| | |
|---------------------------------|---|
| Objectives: | To help the relevant group of stakeholders to build together a number of desired futures (i.e. visions), including clear pathways for their potential realisation. |
| Value proposition: | Build a systemic vision towards (desired and achievable) resilient socio-ecological systems. Also generate dialogue across different actors and sectors and avoid silo-thinking. |
| Advantages: | Incorporating stakeholder engagement into REXUS (through the participatory scenarios and the action of the LAAs) should help bridging the “science-policy gap” while also considering the values and beliefs of the stakeholders as a means to facilitate adoption of potential measures and solutions. |
| Main use: | The planned dialogue and exchange are expected to facilitate negotiation and mutual learning among stakeholders, reduce conflict and increase support and actor buy-in for decisions made. Moreover, this process contributes to raising awareness, increasing the social impact of results or fostering the establishment of collaborative communities in the territory among many others. |
| Alternative uses: | Not available at the present time. |
| What is new: | The participatory methods we are using in REXUS have previously been applied in several previous research projects. However, in REXUS we will be focusing on the actual use of these methods for conflict resolution, i.e. following the REXUS premise of shifting from ‘Nexus thinking to resilient Nexus doing’. |
| Why it is important: | ICATALIST aim to generate successful stories that can help us popularize the adoption of a nexus approach for a more sustainable use of natural resources in the Mediterranean context. |
| What needs does it meet: | WEFC Nexus challenges are complex problems that require of an active and well-organised stakeholder engagement to design implementable solutions. At this stage of the project ICATALIST has chosen a commercial exploitation route. |

| Socio-economic impacts of WEF Nexus-related ES | |
|--|--|
| Declared by: | UNIPD |
| Relevant WP/Task/Deliverable: | WP3, Task 3.6, D3.10 “Report on Socioeconomic indicators for Nexus analysis and management”. |
| Exploitation type: | Non-commercial. |
| Short description: | Not available. |
| Main features: | Through the identification of WEF Nexus-related ES, the design of an evaluation scheme to assess the socio-economic features linked to ES (supply, demand, economic value) through specific indicators, the identification of NBS capable to provide WEF Nexus-related ES. |
| Objectives: | To address WEF Nexus challenges through an Ecosystem Services approach. |
| Value proposition: | It may be offered to actors that will implement NBS to face Nexus challenges (private and public actors). |

| | |
|---------------------------------|---|
| Advantages: | Implement a socio-economic analysis combining a wide range of indicators to assess ES bio-physical features, ES beneficiaries/users, ES economic value. This allow to select the appropriate NBS considering their effects on ES provision. |
| Main use: | To address land use strategies for policy making. |
| Alternative uses: | By private land owners to implement market-based solutions and by researchers for further investigation. |
| What is new: | A selection of indicators comprehensive of bio-physical, social, and economic features for each ES. A further novelty relies on the role of ES as possible solution to address the WEF NEXUS challenges. |
| Why it is important: | To improve the provision of ES needed to face WEF Nexus Challenges. |
| What needs does it meet: | The selection of appropriate NBS capable to provide WEF Nexus-related ES. |

Pilot implementation set-up: Baseline, framework, benchmarking

| | |
|--------------------------------------|--|
| Declared by: | AGRISAT |
| Relevant WP/Task/Deliverable: | WP6, Task 6.1, D6.1 “Baseline description and implementation framework”. |
| Exploitation type: | Commercial. |
| Short description: | Methodology and roadmap for practical implementation of REXUS solutions. |
| Main features: | Methodology for implementation in each pilot area, which is helpful for replication in other areas outside the project. The implementation framework also integrates the co-implementation and the co-validation plan, along with a roadmap for replicating the process outside the project. |
| Objectives: | To provide a methodology and roadmap for applying the REXUS solutions in different pilot areas. |
| Value proposition: | Support to stakeholders in the practical handling of the nexus at different scales, from local communities to national scale. |
| Advantages: | Facilitating a paradigm shift from sectorial thinking to a systems perspective where all elements of the Nexus are present and helping to make the transition from thinking into practical actions. |
| Main use: | To support stakeholders at all levels and scales in the practical implementation of REXUS solutions, also to raise awareness among stakeholder of the implications and advantages of nexus-thinking and -acting. |
| Alternative uses: | The framework is applicable to the implementation of resources governance solutions beyond REXUS. |
| What is new: | Implementation in the pilot cases is being developed with the help of different project partners. We provide an implementation guide structured into actionable steps that supports stakeholders in the practical handling of the nexus at different scales, from local communities to national scale. |

| | |
|---------------------------------|--|
| Why it is important: | All countries or regions are facing problems related with nexus resources, water stress, environmental issues, food and energy security. |
| What needs does it meet: | Stakeholders at all levels and scales need practical guidance and tools, first to transition to nexus thinking and secondly, to proceed to nexus acting. |

Roadmap to identify the potential role of Nature-based solutions for a climate resilient WEF nexus

| | |
|--------------------------------------|--|
| Declared by: | ETIFOR SRL |
| Relevant WP/Task/Deliverable: | WP5, Task 5.2, D5.2 “Roadmap to navigate the available catalogues of EbA solutions and a finalized list of candidate EbA solutions”. |
| Exploitation type: | Non-commercial. |
| Short description: | Not available. |
| Main features: | This document includes a three-dimension roadmap to assist users in selecting NBS to address WEF Nexus challenges. The roadmap finalizes with a list of 51 NBS from where the user can choose, using the considerations from the roadmap. |
| Objectives: | The document has two main objectives. The first is to guide the user through the vast landscape of catalogs and tools in the process of selecting an NBS to address challenges in the context of the WEF nexus. The second objective is to illustrate to the user the potential role of NBS in helping improve the provision of multiple ecosystem services and addressing some of the socio-political challenges that prevent the adoption of a nexus approach. |
| Value proposition: | This document will be of public access through the project's website, but it can lead to requests from environmental authorities or others for consultancies about context-specific applications of the roadmap (e.g. facilitating the selection of NBS considering the local context). |
| Advantages: | The document explores the literature about NBS and place it under the WEF Nexus approach. The report gathers some of the most important references about NBS and WEF nexus, raising the critical concerns in an integrated and easy-to-read way. |
| Main use: | Regional, basin, and local authorities to acquire knowledge regarding NBS in the context of WEF nexus and contribute to better-informed decision making. |
| Alternative uses: | By researchers for further/comparative research and analysis. |
| What is new: | The document is one of the first attempts to link the logic and the considerations about Nature-based solutions under the WEF Nexus framework. |
| Why it is important: | Meeting water, energy, and food securities agendas is a complex task that calls for integrative solutions that address multiple objectives simultaneously and consider potential trade-offs. This document helps decision-makers see the potential of NBS for addressing such challenges and provides a set of options that contribute to doing so. |
| What needs does it meet: | It meets the need to support decision-making in the context of selecting Nature-based solutions under a WEF Nexus approach. |

Coupled resource stock-flow systems model

| | |
|--------------------------------------|--|
| Declared by: | UCAM |
| Relevant WP/Task/Deliverable: | WP4, Task 4.3, D4.5 “Coupled resource stock flow systems model”. |
| Exploitation type: | Non-commercial. |
| Short description: | Not available. |
| Main features: | Extend existing resource flow visualisation tools with stock-flow dynamic models building on the stakeholder inputs from Pilot areas. |
| Objectives: | Enable the modelling of the inertia of interaction across resource systems and thus understanding the delayed consequences across all nexus resources of specific policy actions aimed at single resource management. |
| Value proposition: | This result will be used to explore real and alternative policy initiatives in the pilot cases. |
| Advantages: | The output will inform local, regional and national decision making and generate co-production of knowledge with stakeholders, and to demonstrate the benefits of such an approach for use elsewhere. |
| Main use: | To demonstrate policy implications across all nexus resource sectors to stakeholders and decision makers in pilot study areas. |
| Alternative uses: | By researchers for supporting the comparison of Nexus systems. |
| What is new: | Use of hybrid models based for example on an inappropriate combination of stock-flow analysis, Sankey diagram visualisation and agent based modelling, to track policy implications simultaneously across three coupled resource sectors (water-energy-land) over a suitable future time horizon e.g. to 2050. |
| Why it is important: | To ensure policy decisions made to satisfy stakeholder pressure in one resource sector have their non-intuitive consequential impacts identified and managed across the other inter-connected nexus domains. |
| What needs does it meet: | The need to make informed policy decisions by anticipating all future outcomes beyond those in a single resource sector. |

Report on WEFC-nexus decision-making on progress towards wider SDG delivery

| | |
|--------------------------------------|---|
| Declared by: | UCAM |
| Relevant WP/Task/Deliverable: | WP4, Task 4.4, D4.6 “Report on WEFC-nexus decision-making on progress towards wider SDG delivery”. |
| Exploitation type: | Non-commercial. |
| Short description: | According to UCAM, the SDGs are themselves highly coupled in a complex system, where many critical inter-dependencies are apparent, such that attaining improvement toward one SDG by 2030 may come at the expense of others. WEL nexus systems map directly to SDG2, SDG 6, SDG7 and SD13. |

| | |
|---------------------------------|---|
| Main features: | An understanding of how highly targeted interventions in pursuit of individual SDGs impact more widely across the entire SDG landscape is required, working in those pilot areas which require most progress across the SDGs. |
| Objectives: | The integrated modelling tools being developed will be used to provide information both on fluxes in critical resource stocks over time and across different scales, as well as developing a series of interlinked dynamic visualisations for each resource, showing flows from existing stocks through transformations to final services required to meet specific targets across the wide spectrum of SDGs. |
| Value proposition: | An assessment of how different policy interventions under a range of future scenarios will enhance or impede delivery of the SDGs in selected pilot areas. |
| Advantages: | Recognition of SDG targets as drivers of resource use and the identification of critical limits. |
| Main use: | By researchers, scientists, practitioners to support policy- and decision-makers, and in direct cooperation with a wide range of stakeholders. |
| Alternative uses: | By researchers and scientists to map complex Nexus Systems. |
| What is new: | A direct link between critical resource management and SDG delivery. |
| Why it is important: | Identification of critical limits and consequences of strategic policy choices. |
| What needs does it meet: | Not identified. |

3.1.2 Guidelines and recommendations

This sub-section focuses on the exploitable results that were classified by the consortium members as “Guidelines and recommendations”, i.e.:

- PSDM guidelines for replication (IRSA)
- A simulation game providing visualization of policy impacts for decision makers and wider stakeholders (UCAM)
- Practical guidelines for effective stakeholder engagement (SWRI)
- Critical review of existing Nexus frameworks and frameworks for evaluating adaptation options (WCMC)
- Documentation of REXUS Nature-based Solution Selection Framework including application of visualisation tools adapted for nexus contexts (WCMC)

The REXUS “Guidelines and recommendations” are analyzed below, based on the input provided by the partners.

| PSDM guidelines for replication | |
|--------------------------------------|--|
| Declared by: | IRSA |
| Relevant WP/Task/Deliverable: | WP4, Task 4.2, D4.2 “Framework for PSDM implementation in REXUS case studies”. |

| | |
|---------------------------------|---|
| Exploitation type: | Non-commercial. |
| Short description: | Guidelines will be provided for a wider replication of the PSDM approach to Nexus systems beyond REXUS. |
| Main features: | The key lessons learned and challenges from the experiences in the REXUS pilot will support the exploitation beyond REXUS. Particular attention will be given to the 'participatory' dimension of SDM in Nexus systems. |
| Objectives: | Define guidelines and recommendations for an effective modelling of Nexus systems using System Thinking approaches and the most suitable SDM tool(s). |
| Value proposition: | It could be used by researchers, scientists and practitioners to support decision- and policy-makers interested in using SDM as a support to operationalize the Nexus in a specific area/system. |
| Advantages: | The capitalization of the REXUS experiences in multiple pilots, which have a different geographical location, different objectives and technical challenges, and a specific socio-institutional frame, will help identifying the most suitable approach and tools for supporting the transition from Nexus thinking to Nexus doing without starting from the scratch. |
| Main use: | By researchers, scientists, practitioners to support policy- and decision-makers, and in direct cooperation with a wide range of stakeholders, to implement Nexus thinking approaches. |
| Alternative uses: | By researchers and scientists to map complex Nexus Systems. |
| What is new: | The capitalization of several experiences in different contexts (climatic, environmental, socio-institutional, etc.). |
| Why it is important: | Providing a shared approach and guidelines to PSDM in Nexus Systems will help decision- and policy-makers worldwide in operationalizing Nexus thinking and investigating the evolution of Nexus systems on the long term. |
| What needs does it meet: | The need to operationalize Nexus thinking in different conditions. |

A simulation game providing visualization of policy impacts for decision makers and wider stakeholders

| | |
|--------------------------------------|---|
| Declared by: | UCAM |
| Relevant WP/Task/Deliverable: | WP4, Task 4.4, D4.7 "A simulation game providing visualization of policy impacts for decision makers and wider stakeholders". |

| | |
|---------------------------------|---|
| Exploitation type: | Non-commercial. |
| Short description: | A non-technical simulation game for coupled resource management. |
| Main features: | A simulation environment through which decision makers and other stakeholders can explore the wider influence of policy options, and explore a range off what-if questions. |
| Objectives: | Not identified. |
| Value proposition: | Demonstration and raising of awareness of the wider cross sector implications of policy choices. |
| Advantages: | The ability to explore simulated resource interactions without the need for modelling expertise. |
| Main use: | By practitioners to support policy- and decision-makers, and to stimulate Nexus thinking approaches. |
| Alternative uses: | By trainers and educators to raise awareness of nexus inter-dependencies. |
| What is new: | A novel user friendly simulation environment, not requiring modelling skills by the participants themselves, for use in informal settings. |
| Why it is important: | To raise awareness of unintended consequences and negative outcomes across the WLE nexus and to test the wider viability of preferred solutions. |
| What needs does it meet: | Not identified. |

Practical guidelines for effective stakeholder engagement

| | |
|--------------------------------------|---|
| Declared by: | SWRI |
| Relevant WP/Task/Deliverable: | This exploitable output does not link to any specific Task or Deliverable of REXUS. |
| Exploitation type: | Commercial. |

| | |
|---------------------------------|---|
| Short description: | Not identified. |
| Main features: | Following appropriate rules and employing the right tools, stakeholder engagement may become a valuable tool upon which not only NEXUS management at the pilot or other areas may be assisted, but any other activity in need of participatory approaches may be privileged. Scientific papers and textbooks on stakeholder engagement do exist but practical tips and guidelines are not widely available. |
| Objectives: | To assist and guide bodies wishing to successfully engage stakeholders in participatory approaches. |
| Value proposition: | It may be offered to regional and national authorities but also any other body in need to initiate participatory approaches in the framework of any collective co-action. |
| Advantages: | Co-action (mapping, design, evaluate, approve, agree, so forth) leads to higher impact results. |
| Main use: | By regional, national competent authorities for policy making, or anybody wishing to perform a participatory action. |
| Alternative uses: | For future investment consulting. |
| What is new: | Practical methodological steps that can be easily followed by non-experts in stakeholder engagement, to reach high impact results. Based on scientific knowledge, but stating pitfalls experienced and ways to avoid for an easier and smoother result. A guide of what to expect when you expect results through this approach. |
| Why it is important: | Bridges scientific principles to practical experience in delivering a methodological approach that is probably the only efficient way to reach social consensus hence high implementation level of management measures that may even be strict but necessary and justified. |
| What needs does it meet: | Technocratic comprehensive understanding of NEXUS issues, inter-sectoral collaboration between stakeholders, acceptability by involved partners, social coherence and peace. |

Critical review of existing Nexus frameworks and frameworks for evaluating adaptation options

| | |
|--------------------------------------|---|
| Declared by: | WCMC |
| Relevant WP/Task/Deliverable: | WP5, Task 5.4, D5.5 “Documentation of REXUS Nature based Solution Selection Framework including application of visualisation tools adapted for nexus contexts”. |
| Exploitation type: | Non-commercial. |

| | |
|---------------------------------|---|
| Short description: | Not identified. |
| Main features: | The review will include an introductory and methodology section, followed by an overview/ summary of the Nexus and adaptation frameworks landscape based on information gathered from the literature. There will be a section with discussions on key considerations for linking Nexus and adaptation options frameworks, which will be followed by a final section on proposed elements to be considered in a new REXUS framework. |
| Objectives: | The review will identify commonalities, gaps and success factors, in frameworks aiming to address nexus and climate change adaptation issues, as well as their applicability at different spatial scales (national, transboundary, and subnational). |
| Value proposition: | It may be offered to regional and national authorities for informing decision making when planning sectoral and cross sectoral policies. |
| Advantages: | Climate change considerations and solutions that can support regional and national authorities with adaptation and increasing resilience of the Nexus sectors. |
| Main use: | By regional, national competent authorities for policy making. |
| Alternative uses: | By implementers (NGOs, etc.), funding bodies, spatial planners and generally by the academic sector in NEXUS related research. |
| What is new: | A framework that combines nexus with resilience thinking, and uses nature-based approaches to increase resilience of the Nexus. |
| Why it is important: | It is important to make information available and accessible for parties involved in decision making around increasing the resilience of the WEF Nexus. |
| What needs does it meet: | Policy makers lack an evidence-based framework that helps identify the potential for using nature-based approaches in addition to traditional approaches in decision-making. |

Documentation of REXUS Nature-based Solution Selection Framework including application of visualisation tools adapted for nexus contexts

| | |
|--------------------------------------|---|
| Declared by: | WCMC |
| Relevant WP/Task/Deliverable: | WP5, Task 5.4, D5.5 “Documentation of REXUS Nature based Solution Selection Framework including application of visualisation tools adapted for nexus contexts”. |
| Exploitation type: | Non-commercial. |

| | |
|---------------------------------|--|
| Short description: | Not identified. |
| Main features: | An integrated decision support framework for incorporating nature-based solutions into efforts to secure a climate resilient nexus. The framework will allow users to assess different suites of EbA solutions (including use alongside grey solutions) to address the challenges and opportunities in increasing resilience of the nexus. The framework will further assist users to develop and evaluate the business case for a given approach. |
| Objectives: | Methodological and practical foundations for the selection of suites of solutions that use Ecosystem-based Adaptation as an underlying principle, to be implemented in pilot areas. |
| Value proposition: | It may be offered to regional and national authorities for informing decision making when planning sectoral and cross sectoral policies. |
| Advantages: | An easy to use, clear and specific, insightful, evidence-based framework for selection of NBS within a cross-sectoral nexus context under climate change, considering/integrating nature in the solution set. |
| Main use: | By regional and national competent authorities for policy making. Alternative uses: By implementers (NGOs, etc.), funding bodies, spatial planners and by the academic sector in NEXUS related research. |
| Alternative uses: | Not identified. |
| What is new: | The framework is going to integrate the existing into one single tool, integrating different approaches, standardizing the different approaches. |
| Why it is important: | The expected outcome for WP5 is that decision makers have access to an evidence-based framework and guidance to select suites of solutions that incorporate nature-based approaches to address challenges in increasing the resilience of the food-energy-water nexus. |
| What needs does it meet: | Policy makers lack an evidence-based framework that helps identify the potential for using nature-based approaches in addition to traditional approaches in decision-making. |

3.1.3 Skills and know-how

This sub-section focuses on the exploitable results that were classified by the consortium members as “Skills and know-how”, i.e.:

- Carbon and energy footprint (CIRCE)
- Land Use map of agricultural crops (UCLM)
- Water accounting and footprint (UCLM)
- Land use suitability (UCLM)
- Development of NEXUS based management strategies on the basin scale (SWRI)
- Fit-for-Nexus Climate Risk Assessments (DRAXIS)

The REXUS “Skills and know-how” are analyzed below, based on the input provided by the partners.

| Carbon and energy footprint | |
|--------------------------------------|---|
| Declared by: | CIRCE |
| Relevant WP/Task/Deliverable: | WP3, Task 3.3, D3.6 “Report on energy and carbon accounting and footprints results_ Final version”. |
| Exploitation type: | Non-commercial. |
| Short description: | The data collection will be essential for the future energy needs and its approach to the NEXUS. |
| Main features: | Not identified. |
| Objectives: | Impact on NEXUS. |
| Value proposition: | It may be offered to regional and national authorities for informing decision making when planning sectoral and cross sectoral policies regarding resources. |
| Advantages: | Carbon account footprint reduction. |
| Main use: | By policy makers. |
| Alternative uses: | By renewable energy entrepreneurs for future investment consulting and by researchers for further/comparative analysis. |
| What is new: | New data base for the pilots and potentially other areas. |
| Why it is important: | New policies development. |
| What needs does it meet: | Policy makers do not necessarily have the time and background to synthesize the relevant information from different sources so as to make a well informed decision. |

Land Use map of agricultural crops

| | |
|--------------------------------------|--|
| Declared by: | UCLM |
| Relevant WP/Task/Deliverable: | WP3, Task 3.4, D3.8 “Land-use suitability mapping tool using EO based indicators_ Final version”. |
| Exploitation type: | Non-commercial. |
| Short description: | Not identified. |
| Main features: | The methodology and map for the identification of land use at plot scale. |
| Objectives: | To develop agricultural land use maps based on remote sensing and ancillary data at plot scale. |
| Value proposition: | The maps can be offered as input to other models and authorities for water management. |
| Advantages: | The data can be annually updated with a lower effort than using field work over large areas. |
| Main use: | As input to models and regional, national competent authorities for water management and policy making. |
| Alternative uses: | The results can be used on research activities as input in water balance and energy balance models. |
| What is new: | Using time series of Sentinel images combined with decision trees and machine learning procedures. |
| Why it is important: | It is important because the data are essential for making decision for natural resources such as land and water. |
| What needs does it meet: | The water modelers and land use managers need to know the crop type. |

Water accounting and footprint

Declared by: UCLM

| | |
|--------------------------------------|--|
| Relevant WP/Task/Deliverable: | WP3, Task 3.2, D3.4 “Water accounting and footprint: methodologies and results_ Final version”. |
| Exploitation type: | Non-commercial. |
| Short description: | Not identified. |
| Main features: | This result presents the methodology for determining water accounting and water footprint accounting. It also features maps of crop water necessities and water footprint at plot scale. |
| Objectives: | To account water necessities of crops and determine the water footprint in different regions. |
| Value proposition: | The result helps the water managers to take decisions about water allocation and plan management. |
| Advantages: | The advantages are combining a series of methodologies that apply remotely sensed soil water balance and time-series data for optimal characterization. Furthermore, the result provides transparency about the process of water managing. |
| Main use: | By farms, regional and national water managers. |
| Alternative uses: | By researchers, as a stepping stone for further research in fields like water use efficiency. |
| What is new: | The implementation of remote sensing assisted soil water balance and the derived water footprint. To provide maps at 10 m of pixel size of crop water necessities and water footprint. |
| Why it is important: | It is important because it is a basic information taking advantage of the Copernicus program for a better management of water on large areas. |
| What needs does it meet: | It meets the needs of mapping the water footprint that traditionally has been accounted as an aggregated way and to conserve resources. |

Land use suitability

| | |
|--------------------------------------|---|
| Declared by: | UCLM |
| Relevant WP/Task/Deliverable: | WP3, Task 3.4, D3.8 “Land-use suitability mapping tool using EO based indicators_ Final version”. |

| | |
|---------------------------------|---|
| Exploitation type: | Non-commercial. |
| Short description: | Not identified. |
| Main features: | Selection of crop suitability. |
| Objectives: | Develop an indicator for crop suitability. |
| Value proposition: | The result will provide an indication about the probability of successful crop cultivation regarding agricultural, environment and economic purposes. |
| Advantages: | To provide an indication of future plan management and selection of crops under future climate scenarios. |
| Main use: | By regional and national land use planners. |
| Alternative uses: | By researchers, as a stepping stone for further research in fields like water use efficiency. |
| What is new: | The implementation of current low resolution land suitability maps and crop selection to pilot areas. |
| Why it is important: | It is important because it can be used for selecting suitable crops in food security. |
| What needs does it meet: | It meets the needs of compiling a large amount of information (climatic, soil, agronomy and hydrology) from different sources and formats. |

Development of NEXUS based management strategies on the basin scale

| | |
|--------------------------------------|--|
| Declared by: | SWRI |
| Relevant WP/Task/Deliverable: | This result does not link to a specific Work Package, Task or Deliverable. |
| Exploitation type: | Commercial. |

| | |
|---------------------------------|--|
| Short description: | Not identified. |
| Main features: | Through the appropriate data collection and interpretation and the tailored application of the corresponding methodologies, the resources management strategies will include not only each of the NEXUS aspects, but also their potential interactions accompanied by the stakeholders' perspectives. Although mainly SWRI contributes to the implementation of the methodologies developed in REXUS project, this implementation procedure enforces SWRI's know how in organizing and managing NEXUS based management strategies. |
| Objectives: | To produce management strategies on the basin scale that incorporate all NEXUS aspect and their interactions. |
| Value proposition: | It may be offered to regional and national authorities for informing decision making when planning for resources management and sectoral and cross sectoral policies. |
| Advantages: | Since the majority of resources management strategies are compiled individually for each of the NEXUS aspects, approaching them in an integrated way can provide more feasible and sustainable results and solutions that are highly acceptable from the community through co-creation. |
| Main use: | By regional, national authorities and policy makers. |
| Alternative uses: | For provision of consulting services in the future. |
| What is new: | Despite the fact that several studies and strategies are developed in the regional or national scales they usually approach each NEXUS sector individually. SWRI's know how gathered through NEXUS project will allow them to approach all NEXUS sectors in an integrated way and make concrete use of well-established methodologies that take the stakeholders' opinion into consideration regarding their involvement in the strategy development. |
| Why it is important: | It is important due to the fact that when making a decision about a sector of the NEXUS, all the other sectors are taken into account through their cross-sectoral interactions. |
| What needs does it meet: | Policy makers do face significant problems when trying to make their decisions for one sector, since it is not easy to identify the potential impact of their decisions to the other sectors. |

Fit-for-Nexus Climate Risk Assessments

| | |
|--------------------------------------|--|
| Declared by: | DRAXIS |
| Relevant WP/Task/Deliverable: | WP3, Task 3.1, D3.2 "Data Integration and Visualisation: strategy and results_ Final version". |

| | |
|---------------------------------|---|
| Exploitation type: | Non-commercial. |
| Short description: | Not identified. |
| Main features: | Through the climate risk assessments, information on climate change in the form of composite climate indicators is used in combination with other relevant information on exposure and vulnerabilities associated to the Nexus sectors of food, water and energy. |
| Objectives: | To produce fit-for-Nexus climate risk assessments; to support well informed decision making. |
| Value proposition: | It may be offered to regional and national authorities for informing decision making when planning sectoral and cross sectoral policies. |
| Advantages: | Combination of a wide range of indicators to produce ready to use information taking into account climate indicators of high significance for the Nexus sectors; visualization at spatial level for easily recognizing the most vulnerable areas (e.g. areas that will be exposed to climate risks where there is also presence of Nexus elements such as agricultural areas, renewable energy plants and with high sensitivity, e.g. crops with low tolerance to high temperatures, droughts, etc.). |
| Main use: | By regional and national authorities and policy makers. |
| Alternative uses: | By farmers and renewable energy entrepreneurs for future investment consulting and by researchers for further/comparative analysis. |
| What is new: | The methodology proposed for the assessment takes into account a wide range of relevant indicators relevant to climate change, exposure, vulnerability and adaptation for the Nexus sectors and visualizes the overall assessment results through maps, thus providing a holistic picture of the climate risks. This type of service is new to most of the pilot areas as the current/usual approach in impact assessments is simpler. |
| Why it is important: | It is important that when making a decision, all critical information is available and in an easily comprehensible form for the decision maker. |
| What needs does it meet: | Policy makers do not necessarily have the time and background to synthesize the relevant information from different sources so as to make a well informed decision. |

3.2 Intellectual property considerations

This section focuses on the issues related to the Intellectual Property (IP) of the REXUS project and some of the most usual, yet suitable to the project, means of Intellectual Property Rights (IPR). Considering Intellectual Property is very important when it comes to the exploitation of results, as various conflicts may arise if they are not properly taken into account. The sub-section 3.2.1 includes, the definitions provided by the European IPR Helpdesk with respect to the IP, the background and foreground IP, and the External IP. Sub-section 3.2.2 focuses

on the relevant Intellectual Property Rights that could be employed by the REXUS partners. Sub-section 3.2.3 focuses on the IPR management issues that were declared by the consortium members.

3.2.1 Intellectual Property

The term Intellectual Property refers to the creations of the mind, such as inventions, literary and artistic works, designs and symbols, names and images used in commerce (European Commission, 2022). Regarding the ownership of the generated results, based on the REXUS Grant Agreement - Article 26 "Ownership of results", they are owned by the beneficiary that generated them. All consortium members also verified this principle as part of the project's Consortium Agreement (CA). Given the collaborative nature of REXUS, some results are jointly developed by several partners. In such cases the so-called "joint ownership" might arise. As stated in the Grant Agreement – Article 26.2, two or more beneficiaries own results jointly if they have jointly generated them or it is not possible to establish the respective contribution of each beneficiary. In this case, it is strongly recommended for the involved parties to establish a joint ownership agreement, to properly establish their participation and value in this joint effort and agree on issues related to the exploitation and dissemination of the joint results.

Background IP refers to any data, know-how or information (including any rights), that is held by REXUS partners before entering the project and that is needed to implement the project or to exploit its results (art. 24 GA). Background IP is not limited to owned input, but potentially extends to anything the beneficiaries lawfully hold (e.g. through a license with the right to sub-license). It also extends to input held by other parts of the beneficiary's organisation (D1.3, REXUS, 2021).

All REXUS partners have identified in the REXUS GA the background knowledge that is relevant for the implementation of the project and have declared the access rights to this IP. Access rights during the project have to be granted on a royalty-free basis. The background IP will form the basis of an "agreement on the background" that will be developed within the context of a REXUS IPR Agreement to be signed by the end of the project (D1.3, REXUS, 2021).

Moving on to the Foreground IP, this term refers to the tangible and intangible results that will be generated within the REXUS project, including pieces of information, materials and knowledge and whether they can be protected or not. It covers intellectual property rights (e.g. copyrights, patents, trademarks, utility models etc.), similar forms of protection (e.g. rights for databases) and unprotected know-how (e.g. confidential material), that is generated during the project (section 2.2.4 GA) (D1.3, REXUS, 2021; European Commission, 2022).

In this respect, both background and foreground IP should be taken into account by the project partners when planning to exploit project results.

Last but not least, bringing into REXUS external IP, either in the form of open source or third party's IP, entails both benefits and risks. Any external source, such as technology, data, methodologies, used in the project's framework runs the risk of infringing on a competitor's patent or license agreement, and therefore it calls for special attention. In many cases, there are ideas, algorithms, software etc., that can be used within a research project, as long as they are not commercially exploited. However, the use of such external IP, may be available only to academic partners, and limited only to research purposes. It is of utmost importance that the integration of external IP into a subsystem for further exploitation does not infringe the usage conditions. Any unintentional infringement of a third party's IPR could lead to significant legal penalties, and also to a prohibition from continuing to benefit commercially from the affected results. Therefore, all REXUS partners owe to scan third party IPR to assess possible risks and limitations for exploitation of their results.

The only instance of the use of third party knowledge in REXUS is the use of data, that are external to the project, in the framework of WP3 and particularly in Task 3.3, by the Consortium member CIRCE. It is noted that some of the data provided by certain third parties are confidential and therefore the exploitation of the results or their sharing with external stakeholders, is not an option.

3.2.2 Intellectual Property Rights

The Intellectual Property Rights are legal rights that aim to protect any form of Intellectual Property. They are mainly divided into two categories: Industrial Property Rights (e.g. patents, trademarks) and Copyright and Related rights (European Commission, 2022). As far as the REXUS project is concerned, the IPR are addressed in Deliverable 1.3 “Knowledge Management Strategy”. The selection of the most suitable form of IP protection depends on the nature and specific characteristics of the results under consideration and the objectives of the IP owner. Following, in Figure 13 the most relevant types of rights for the REXUS project are presented in brief.

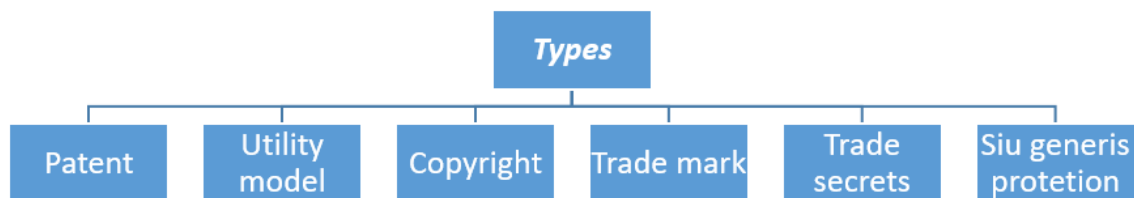


Figure 13: Types of Intellectual Property Rights

Firstly, one of the most important, and commonly used IPR is the **patent**. A patent is an exclusive right acquired for the protection of inventions (products or processes) that offer a new technical solution or facilitate a new way of doing something. The patent owner has the exclusive right to block third parties from commercially exploiting their invention for a limited period of time. In return, the patent holder must disclose the invention to the public in the patent application (European Commission, 2019b).

Moving on, a **utility model** is particularly suitable for protecting inventions that make minor improvements to, and adaptations of, existing products or that have a short commercial life (D1.3, REXUS, 2021). Utility models are exclusive rights granted to a right holder for an invention which does not fulfil patentability requirements (e.g. because it is a minor improvement of an existing product) but may still have an integral role in a local innovation system (European Commission, 2019b).

Another frequent means of protection of Intellectual Property is a **copyright**. More specifically, a copyright is a legal term used to describe the rights that creators have over their literary, scientific and artistic works. Works covered by copyright may include inter alia computer programs, databases, maps, and technical drawings (European Commission, 2019b). In the case of REXUS, the exploitable results related to algorithms and models, software and databases could be protected through copyright.

A **trademark** is one of the most well-known IPRs and is an exclusive right over the use of a sign regarding the goods and services for which it is registered. This entails that the right holder has exclusive use of the trademark unless he/she comes to the decision to license it to a third party in return for payment. The main function of a trademark is to identify the commercial origin of a specific product. They can also be used as an investment instrument as they can be assigned, licensed, etc.

On the other hand, a **trade secret** refers to any confidential business information providing a competitive advantage to an enterprise. The type of information that can be protected as a trade secret is highly diverse and can include know-how, technical knowledge, but also business and commercial data such as lists of customers,

business plans, recipes or manufacturing processes. Trade secrets offer right owners protection when it comes to confidential information that can be sold or licensed (European Commission, 2019b).

Another IPR that is not commonly used, but could be of great interest regarding REXUS is a **sui generis protection**. A sui generis protection aims to protect the content of a database preventing the extraction and/or reuse of the whole or substantial part of its content when the structure of a database is not an original creation. To benefit from this right, the one that constructed the database must be an EU national or resident in the EU and has to prove to have made a substantial investment (financial, material and/or human) in either, obtaining the verification or the presentation of the database content (European Commission, 2019b).

3.2.3 IP declarations by REXUS partners

This section is devoted to the input that was provided by the REXUS consortium members regarding the IP of their exploitable results. Table 2 summarizes the background IP and IPR related to the identified exploitable results that are planned to be exploited, as well as, the ownership of the results (foreground IP) and the intention to pursue a means of protection are shown.

Table 2: IPR considerations

| Project partners | Background IP | Protection of background IP | Other owners | Intention of protection of exploitable results (Foreground IPR) |
|------------------|---------------|-----------------------------|--------------|---|
| IRSA | No | No | Yes | No |
| ICATALIST | No | No | No | No |
| UNIPD | No | No | No | No |
| CIRCE | No | No | No | No |
| AGRISAT | Yes | Yes | No | No |
| ETIFOR SRL | No | No | No | No |
| UCAM | No | No | Yes | No |
| UCLM | Yes | Yes | No | No |
| SWRI | No | No | Yes | No |
| WCMC | No | No | Yes | No |
| DRAXIS | No | No | No | No |

One instance of background IP related to a project result is declared by UCLM and refers to their exploitable outputs titled “Land Use map of agricultural crops” and “Water accounting and footprint”. They also claimed that

there is not any form of active background IPR regarding this case. Considering the above, it is concluded that the stated IP and means of protection will not pose any problem to the exploitation of the results.

Most project partners (64%), stated that they are the sole owners of their exploitable outputs while the remaining 36% declared that there are other project partners contributing in the generation of the exploitable results. In these cases, an investigation will take place during the second phase, regarding the intentions of the other partners for the exploitation of the results. In the table that follows, the project results that have been declared to be owned by more than one partners, are presented.

Table 3: Project results with joint ownership

| Exploitable result (WP, Task, Deliverable) | Joint owners |
|---|-----------------------------------|
| Nexus-related indicators (WP4, Task 4.1, D4.1) | IRSA, UCAM, DELTARES |
| PSDM framework (WP4, Task 4.2, D4.2) | IRSA, UCAM |
| PSDM guidelines for replication (WP4, Task 4.2, D4.2) | IRSA, UCAM, DRAXIS |
| Coupled resource stock-flow systems model (WP4, Task 4.3, D4.5) | UCAM, IRSA |
| Report on WEFC-nexus decision-making on progress towards wider SDG delivery (WP4, Task 4.4, D4.6) | UCAM, IRSA |
| A simulation game providing visualisation of policy impacts for decision makers and wider stakeholders (WP4, Task 4.4, D4.7) | UCAM, IRSA |
| Practical guidelines for effective stakeholder engagement (This exploitable output does not link to any specific Task or Deliverable of REXUS) | SWRI, ICATALIST |
| Critical review of existing Nexus frameworks and frameworks for evaluating adaptation options (WP5, Task 5.4, D5.5) | WCMC, DELTARES, ETIFOR SRL, UNIPD |
| Documentation of REXUS Nature-based Solution Selection Framework including application of visualisation tools adapted for nexus contexts (WP5, Task 5.4, D5.5) | WCMC, DELTARES, ETIFOR SRL, UNIPD |

According to Table 3, 47% (9) of the REXUS exploitable results are jointly owned by several members of the consortium. On average, the number of consortium members that jointly own an exploitable output is three. Therefore, it is of vital importance that during the second phase the involved parties establish a joint ownership agreement, to properly describe their participation and value in this joint effort and agree on issues related to the exploitation and dissemination of the joint results.

Finally, it is worth noting that the partners did not identify any means of IP protection regarding their exploitable result (foreground IPR) at this phase. Thus, it is of the utmost importance that these means are thoroughly discussed and finalized during the 2nd phase of REXUS.

3.3 Market analysis

In this section, a market analysis with respect to the relevant markets identified by the REXUS partners for their exploitable results, takes place. Furthermore, the potential end-users of REXUS’ results and their main benefits from the use of the results are presented, as well as the barriers that the consortium members have identified that could hinder the uptake of their exploitable output.

Table 4 indicates the markets, the end-users and the barriers that were identified by the project partners.

Table 4: Market analysis input declared by partners (numbers on brackets indicate frequency)

| Markets | End-users | Barriers |
|---|--|---|
| -Environmental consulting services market (10) -Nature based Solutions market (2) - Not defined (7) | -Policy makers (14) -Researchers (3) -Public authorities (2) | -Skills shortages (7) -Inadequate financing (1) -Regulations that hinder innovation (2) -Not defined (9) |

As shown in Table 4, 53% (10) of the project’s results that were declared by its partners are foreseen to be related to the Environmental Consulting Services market, while 10% (2) of them have been related to the Nature based Solutions market (NBS). As for the rest 37% (7) of the results, the respective project partners did not identify any potential market for their exploitable result. The fact that the relevant market may not currently exist, may constitute a barrier for the exploitation of the results (see more in sub-section 3.3.3), but it could also be a business opportunity that would ultimately boost the impact of REXUS. Furthermore, 72% (14) of the partners have identified the policy makers as the targeted end-user group of their exploitable output, and 14% (3) the researchers, while the rest 14% (3) have selected public authorities. Regarding the barriers for exploitation that were identified by the project partners, 37% (7) were related to skills shortages, while 11% (2) of the consortium regulations that hinder innovation and 5% (1) of them inadequate financing. In addition, 47% (9) of the project partners could not identify any barriers for the uptake of their result(s). Further elaboration on these matters is planned to take place in the later months of REXUS.

3.3.1 Markets

In this section, a market analysis with respect to the current situation in the Environmental Consulting Services (ECS) market and the Nature Based Solutions (NBS) market is presented. These markets were selected due to the fact that all the project’s exploitable outputs are targeted towards these domains.

3.3.1.1 The environmental consulting services market

In general, the environmental consulting services (ECS) market consists of the sales of environmental consulting services and related goods by entities (organisations, sole traders and partnerships) that provide advice, assistance, and action plans to organisations and governments to manage their environment (The Business Research Company, 2021).

The environmental consulting services undertake processes where human capital is the main input. They make available the knowledge and skills of their employees, often on an assignment basis, where an individual or a team is responsible for the delivery of services to the client (The Business Research Company, 2021).

The main types of environmental consulting services are site remediation, water and waste management consulting services, environmental management, compliance and due diligence and other environmental consulting services. Furthermore, the environmental consulting services market comprises services that revolve around the assessment of environmental impact of companies and products (Ashlan Bonnell, 2021). To be more specific, the environmental consultancies mostly comprise various disciplines such as contaminated land, energy, geotechnical, environment management systems, green claims, compliance, environmental impact assessment, flood risk assessment, and others (The Insight Partners, 2021).

Market size and growth rate

The global environmental consulting services market reached a value of nearly \$29,082.2 million in 2020, having increased at a compound annual growth rate (CAGR) of 0.9% since 2015. The market is expected to grow from \$29,082.2 million in 2020 to \$36,926.7 million in 2025 at a rate of 4.9%. The market is then expected to grow at a CAGR of 3.7% from 2025 and reach \$44,240.1 million in 2030 (The Business Research Company, 2021). The environmental consulting services market in Europe is expected to grow from US\$ 8,356.29 million in 2021 to US\$ 11,954.86 million by 2028. It is estimated to grow at a CAGR of 5.2% from 2021 to 2028 (Ashlan Bonnell, 2021).

That is a resilient performance given the unexpected and unprecedented challenges thrown up by the health crisis disruption and market reverberations, which saw global economic growth dip to -3.3%, making the COVID-19 recession the largest seen since the second world war (Environment Analyst Global, 2021). The outbreak restricted the supply chain in various countries in Europe. The vast majority of the member states of Europe implemented drastic measures and travel restrictions to limit the spread of COVID-19 among their citizens. European countries represent a major share in the market as Europe has the highest environmental safety standards in world and it will require time to stabilize (Ashlan Bonnell, 2021).

Market trends and drivers

According to the US Bureau of Labor Statistics (BLS), public awareness and concern about climate change are crucial drivers in the growing need for qualified environmental consultants. The Environmental Consulting industry is expected to continue to experience revenue growth as climate change persists to be a growing cause of concern. With greater measures being taken to reduce greenhouse gas (GHG) emissions across the globe, and increasing pressure from investors and consumers, companies in many industries are striving to remain ahead of regulatory changes. This increased emphasis on environmental sustainability is anticipated to support industry revenue growth (IBIS World, 2021).

Thus the obvious market trend is the foreseen need for consultants specifying in the means of diminishing the hazardous environmental outcome from companies and industries, specifically the reduction of greenhouse gas

emissions. Moreover, the know-how of the implementation and the implication of such methods and technological applications is going to be crucial.

Furthermore, economic sectors of priority with respect to climate change (e.g. agriculture and food security, disaster risk reduction, energy, health, and water), tend to have more readily-available information on how climate services can be applied within the sectors, and what the drawbacks to using them are. However, as the impacts of climate change start to be felt across multiple economic sectors, and as consumers start to push companies to make combatting and adapting to climate change a more prominent part of their business plans, climate services are emerging among a broad range of industries and for multiple purposes. Thus, the climate services market can be expected to evolve in the near future, as more investments are made and climate change impacts become an ever-present reality that must be dealt with (Tart et al., 2020). Additionally, the rising adoption of renewable technologies for cleaner and greener environment is among the other factors expected to fuel the demand for environmental consulting services in Europe (Ashlan Bonnell, 2021).

Additionally, end-users such as governments and regulators was the largest segment of stakeholders that the environmental consulting services market was targeted towards and it accounted for 33.4% of the total in 2020(The Business Research Company, 2021). Accordingly, there is a significant demand for the provision of environmental consulting services that are aimed at stakeholders such as public authorities and policy makers. This is demand in conjunction with the foreseen evolution of the climate services market, that was mentioned before, fit the vast majority of the project's results and enhance the market penetration of REXUS' exploitable results and ultimately the project's impact.

3.3.1.2 Nature based solutions market

Market size and growth rate

A huge part of the environmental technology market is the Nature Based Solutions (NBS) market. There has been a great deal of recent interest in NBS as an approach to tackle climate change with socio-economic and environmental co-benefits (David Simpson & American University School of International Services, 2020). NBS are intended to support the achievement of society's development goals and safeguard human well-being in ways that reflect cultural and societal values and enhance the resilience of ecosystems, their capacity for renewal and the provision of ES. NBS are designed to address major societal challenges, such as food security, climate change, water security, human health, disaster risk, social and economic development. In framing NBS and considering its applications, it is useful to think of it as an umbrella concept that covers a whole range of ecosystem-related approaches all of which address societal challenges (IUCN, 2022).

Some of the main categories of NBS approaches include, ecological restoration and engineering, forest landscape restoration, climate adaptation services, ecosystem-based disaster risk reduction, green infrastructure, integrated water resources and coastal zone management and area-based conservation approaches (IUCN, 2022). In essence, NBS are an ecological approach to climate change action, whilst also enhancing the resilience of natural and managed ecosystems and the human settlements that adjoin them (David Simpson & American University School of International Services, 2020).

In Europe, the IUCN European Regional Office works closely with EU institutions, EU member states and other key stakeholders to ensure that the concept of nature-based solutions is well-known, accepted, and reflected in policies across different sectors and levels of government. In 2015, IUCN welcomed the European Commission's decision to make nature-based solutions part of the Horizon 2020 programme for research and innovation which signifies a major step towards positioning the EU as a world leader in innovation with nature (IUCN, 2022).

The Nature based solutions market has been characterized as one of the fastest growing markets right now. As of 2019, only \$20.75 billion of private capital was estimated to have flowed into nature-positive activity and conservation investments. NBS offer practical opportunities for creating pathways to delivering investment into nature from the global capital markets, currently estimated to be worth approximately \$200 trillion in the end of this decade. This results in a 14.45% annual growth rate. Controlling an estimated \$87 trillion in assets, a significant proportion of the global capital markets, institutional investors have a critical role to play in bringing the NBS sector to scale. Several NBS sub-sectors exist, with each theme at a different stage of commercial development. The most developed sectors are closely linked to major commodity markets, which tend to be larger-scale and attract greater volumes of investment (Curran et al., 2021).

Market trends and drivers

The world is currently facing twin threats of the climate and nature crises. One cannot be solved without addressing the other and natural systems will play a critical role in adaptation and in building resilience. Halting the destruction of natural ecosystems must go hand in hand with rapid decarbonisation. Moreover, recognizing the interconnection between nature and climate change, and integrating natural processes and systems into public and financial assessments of climate change and its impacts, are going to play a fundamental role in successful action on climate change (Jackson, 2021).

Under the 2015 Paris Agreement, nearly 200 countries have endorsed the global goal of limiting the rise in average temperatures to 2.0 degrees Celsius above preindustrial levels, and ideally 1.5 degrees. Reaching the 1.5-degree target would require that global greenhouse-gas emissions are cut by 50 percent of current levels by 2030 and reduced to net zero by 2050. More companies are aligning themselves with this agenda. In less than a year, the number of companies with net-zero pledges doubled, from 500 in 2019 to more than 1,000 in 2020 (Blaufelder et al., 2021).

Specifically, natural climate solutions for carbon can provide around 30% of the emissions reduction required to achieve the 1.5-degree target. Yet the sector only receives 8% of public climate finance, according to the Climate Policy Initiative's climate finance analysis. To be more specific, mitigating climate change through grey infrastructure¹ costs over \$300 billion a year while nature based solutions pose a cheaper, more effective, and sustainable option. Despite the advantages of natural solutions, they receive only 2.5% of public climate mitigation funding regarding this particular application. As a result, governments need to further recognize and act on the potential of the agricultural solutions available today as very few references to policies to protect and establish healthy soils, regenerative agriculture, and "carbon farming" practices, which have significant potential to increase the land's ability to store carbon (World Economic Forum ,2021).

The market trend in the NBS market seems to be the proposition and implementation of NBS into a country level and financial assessments of climate change and its impacts. So allowing forests to regrow, restoring coastal wetlands, and switching to restorative agricultural practices, such as cover crop rotation, that support healthy soils and general Ecosystem-based Adaptation (EbA) are foreseen to be of the utmost importance regarding the reduction of climate change by capturing CO₂ from the air and sequestering it in plants, soils, and sediments (IUCN, 2022)

¹ Grey infrastructure refers to the human-engineered infrastructure for water resources such as water and wastewater treatment plants, pipelines, and reservoirs. Grey infrastructure typically refers to components of a centralized approach to water management.

3.3.2 Customers/End-users

Stakeholders, such as customers and end-users, are parties that will be affected by operations, objectives and results of a project. Generally, stakeholders that are relevant to a project are categorised and mapped according to several different perspectives including their geographical broadness, domains, type of activity, interest in the portfolio of results, and level of influence (Drago & Minichiello, 2022).

There are several groups of end-users that would benefit from the project's results. First and foremost, policy makers and public authorities that are involved in Water-Energy-Food (WEF) nexus, both at a local scale, such as the respective ministries, local municipalities and regional water management authorities, environmental management and agricultural production authorities and at an international level as well. They may use several of REXUS' tools and methodologies for understanding Nexus systems and their cross-sectoral nature, thus developing new policies and considering alternative solutions regarding strategic planning processes for Nexus systems. Such processes could be participatory scenario planning that aims to resolve conflicts on resources management, under a climate change context, manifestation of land use strategies or even integrated solutions and strategies that policy makers are not able to develop themselves. In addition, REXUS will give policymakers an objective view about what issues are more pressing and what their consequences could be. They will then be able to assess the NBS that, beyond the technical feasibility, will be the most suitable to address the socio-economic challenges and ready to be implemented by appropriate business and governance models. The example of successful implementation could be also used by other neighboring authorities in order to cope with the efficient implementation and management WEF nexus, which falls under the replication of the project's results umbrella.

Another group of potential stakeholders is the private sector, mainly companies that focus on environmental consulting. They may use some of the project's tools to consider the development of a business activity including NBS and to provide consulting services to several customer groups. Furthermore, REXUS' framework will enable private companies to consider the investment in Nexus-supportive NbS as part of their business, by providing evidence of effectiveness and economic and financial sustainability in the long term and valuable data through the project's website. Moreover, guidelines and supporting material will be produced through the project, thus enabling organisations to organize and run similar processes in other areas, i.e. to replicate REXUS' in different contexts. The replication will also benefit from recommendations and lessons learnt based on the knowledge compiled after the application of the project's participatory processes in several Pilot areas with very variable social landscapes and Nexus challenges. What is useful for the end-users here is the provided know-how, technical knowledge, tools and methodologies that several partners have acquired and market towards private companies and policy makers, as mentioned before.

Researchers could benefit from the project's results as well, at both individual and institutional level (universities, research projects). Through the REXUS framework they could understand and explore the potential evolution of Nexus systems under different scenarios, beyond the ones involved in the project. Furthermore, the project's framework and data provided via its website, can help researchers better understand and map Nexus systems, whilst analyzing their cross-sectoral correlation. NbS designers and developers (universities, research institutes etc.) may use some of REXUS' tools while developing NbS or while implementing/enhancing existing solutions, keeping an eye on the Nexus issues. Moreover, the project provides a conceptual framework for considering the nexus approach in relation to climate change adaptation, showing the potential synergies and trade-offs, that offer a broader framework for making adaptation to the situation in peripheral regions more effective, which can be a stepping stone for further research on the matter and ultimately boost collaboration in the research sector. Additionally, researchers will be able to support policy and decision makers, and in direct cooperation with other stakeholder groups, to ultimately contribute to the implementation of Nexus thinking approaches.

3.3.3 Barriers

Potential obstacles that could affect REXUS exploitation could be generated from a plethora of different issues. Firstly, consequences of climate change, the COVID-19 pandemic, or socioeconomic stability in regional contexts could have a serious impact on the sites involved in the project's pilots. Furthermore, the WEFC Nexus concept is not yet taken into account at all levels, and needs to be further promoted in public administrations, industry and civil society. Policies related to the WEFC Nexus are currently fragmented at the sector and geographical level. Also, policy makers and institutions at the local, regional, and national levels do not always share the same knowledge on the WEFC Nexus and do not have easy access to digital materials. In addition, policies are too much focused on specific sectors and a global view is often missing. Moreover, receiving the attention of stakeholder groups such as civil society and researchers is not easy as the WEFC sectors are highly fragmented, and it might be very difficult for them to plan and organize something together in this field. Accordingly, there is a requirement for collaborative efforts across sectors through transparent and accountable decision-making, involving civil society and the research community in order to successfully move towards a sustainable development that takes into account the Nexus approach (Drago & Minichiello, 2022).

In the process of the collection of input, all the REXUS consortium members were asked to clarify if they have faced any barriers through the project's lifetime and any potential challenges that could hinder the exploitation of their result(s). The main barrier that was identified by the project partners was the lack of skills regarding certain project activities. These barriers include, among the others, a limited understanding and use of indicators for non-technical stakeholders, lack of knowledge base on SDM principles and some modelling skills, difficulties in applying proper ES bio-physical evaluation and shortage of specialist facilitators to run simulation games that relate to REXUS. Another barrier that is usually mentioned by the consortium members is the lack of available data. In addition, communication barriers and inadequate financing, in the sense of lack of willingness from regional policymakers and authorities to support, adapt to or incorporate some of the project's processes and methodologies, were referred as barriers too.

3.3.4 Input declared by partners

This section focuses on the input provided by the project partners regarding the potential markets, stakeholders, competitive solutions and barriers related to their exploitable results.

3.3.4.1 Methods

Following, the input provided by the REXUS partners on the market analysis for the exploitable results that were categorized as "**Methods**" is provided.

- Nexus-related indicators (IRSA)
- PSDM framework (IRSA)
- Visioning for resilient nexus (ICATALIST)
- Socio-economic impacts of WEF Nexus-related ES (UNIPD)
- Pilot implementation set-up: Baseline, framework, benchmarking (AGRISAT)
- Roadmap to identify the potential role of Nature-based solutions for a climate resilient WEF nexus (ETIFOR SRL)
- Coupled resource stock-flow systems model (UCAM)
- Report on WEFC-nexus decision-making on progress towards wider SDG delivery (UCAM)

Nexus-related indicators

| | |
|--|--|
| Declared by: | IRSA |
| Relevant WP/Task/Deliverable: | WP4, Task 4.1, D4.1 “Report on PSM and SNA. Identification of DOs, NRQs and Nis”. |
| Potential markets: | IRSA has not identified any potential markets regarding this exploitable output. |
| Potential customers and/or end-users: | Policy makers is the main stakeholder group that this result is aimed towards. Furthermore, national and regional public authorities could also benefit from this output. The definition and selection of indicators can help better understanding Nexus systems and the cross-sectoral implications of policy actions, making informed-decision, visualizing and communicating assessments in a simplified yet scientifically sound form. |
| Competitive solutions: | IRSA has not identified any competitive solutions regarding this exploitable result. |
| Barriers: | The main barrier is related to the potentially limited understanding and use of indicators for non-technical stakeholders, and to the potential over-simplification of complex Nexus systems. |

PSDM framework

| | |
|--|--|
| Declared by: | IRSA |
| Relevant WP/Task/Deliverable: | WP4, Task 4.2, D4.2 “Framework for PSDM implementation in REXUS case studies”. |
| Potential markets: | IRSA has not identified any potential markets regarding this exploitable output. |
| Potential customers and/or end-users: | Researchers is the end-user segment that this result is aimed towards. A PSDM framework can help better understanding and mapping Nexus systems, also analyzing the cross-sectoral implications of policy actions, ultimately supporting informed decision-making. |
| Competitive solutions: | IRSA has not identified any competitive solutions regarding this exploitable result. |
| Barriers: | The main barrier is the need for a solid knowledge base on SDM principles and some modelling skills. Additional barriers might be related to the usual challenges of participatory processes. |

Visioning for resilient nexus

| | |
|--|--|
| Declared by: | ICATALIST |
| Relevant WP/Task/Deliverable: | WP2, Task 2.6, D2.8 “Report on transition pathways for REsilience neXUS in pilot areas”. |
| Potential markets: | ICATALIST has stated that a possible market for this exploitable result could be the Environmental Consulting Service market. More specifically, ICATALIST could offer consulting services on conflict resolution and scenario planning (including governance and PEA analysis). |
| Potential customers and/or end-users: | Policy makers and public authorities who need support in participatory scenario planning as a means to resolve conflicts on resources management (under a climate change context). |
| Competitive solutions: | There have been several initiatives for conflict resolution on similar type of contexts (e.g. water for agriculture vs water for environment). The partner’s approach aims to contribute by adopting a more systemic approach building on nexus concept and by deeply incorporating all relevant actors through a participatory process endorsed by sound scientific data and knowledge. |
| Barriers: | A main barrier is political willingness to support this kind of processes (e.g. interest of policy-makers in short-term results vs long-term planning). |

Socio-economic impacts of WEF Nexus-related ES

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|--|--|
| Declared by: | UNIPD |
| Relevant WP/Task/Deliverable: | WP3, Task 3.6, D3.10 “Report on Socioeconomic indicators for Nexus analysis and management”. |
| Potential markets: | UNIPD has identified the Environmental Consulting Service market as a potential market for this exploitable output. UNIPD states that it could to offer consulting services on ES identification and assessment. |
| Potential customers and/or end-users: | Policy makers with the aim to address land use strategies. Also, public or private land owners to implement market-based solutions. |
| Competitive solutions: | UNIPD has not identified any current competitors regarding this project result. |
| Barriers: | Difficulties in applying proper ES bio-physical evaluation and issues in including ES synergies and trade-offs inside the evaluation. |

Pilot implementation set-up: Baseline, framework, benchmarking

| | |
|--|--|
| Declared by: | AGRISAT |
| Relevant WP/Task/Deliverable: | WP6, Task 6.1, D6.1 “Baseline description and implementation framework”. |
| Potential markets: | Consulting services on WEFC NEXUS. |
| Potential customers and/or end-users: | Stakeholders with the intention and/or mandate to implement nexus-related solutions. |
| Competitive solutions: | AGRISAT has not identified any current competitors regarding this project result. |
| Barriers: | Some data is inaccessible and private due to the politics on the construction/development/policies of the country pilots may have: either lost the data, be truly private (a work on an NDA is being discussed, plus working on estimations as mitigation plan). |

Roadmap to identify the potential role of Nature-based solutions for a climate resilient WEF nexus

| | |
|--|--|
| Declared by: | ETIFOR SRL |
| Relevant WP/Task/Deliverable: | WP5, Task 5.2, D5.2 “Roadmap to navigate the available catalogues of EbA solutions and a finalized list of candidate EbA solutions”. |
| Potential markets: | This result could lead to consultancies about identifying Nature based Solutions (NbS) with a Nexus approach and quantifying their benefits. |
| Potential customers and/or end-users: | This roadmap is intended to be used mainly by authorities who have decision over a territory and the implementations that can be done. It can also be used by researchers as WEF Nexus literature. |
| Competitive solutions: | ETIFOR SRL has not identified any current competitors regarding this project result. |
| Barriers: | ETIFOR SRL has not classified any current barriers regarding this output. |

Coupled resource stock-flow systems model

| | |
|---------------------|------|
| Declared by: | UCAM |
|---------------------|------|

| | |
|--|---|
| Relevant WP/Task/Deliverable: | WP4, Task 4.3, D4.5 “Coupled resource stock flow systems model”. |
| Potential markets: | UCAM has not identified any potential market regarding this exploitable output. |
| Potential customers and/or end-users: | Policy makes, resource managers, utility companies. Local stakeholder groups, public interest groups. |
| Competitive solutions: | UCAM has not identified any current competitors regarding this project result. |
| Barriers: | The main barrier is in availability of necessary baseline data across all W-L-E sectors that are catchment related rather than from national databases. |

Report on WEFC-nexus decision-making on progress towards wider SDG delivery

| | |
|--|--|
| Declared by: | UCAM |
| Relevant WP/Task/Deliverable: | WP4, Task 4.4, D4.6 “Report on WEFC-nexus decision-making on progress towards wider SDG delivery”. |
| Potential markets: | UCAM has not identified any potential market regarding this exploitable output. |
| Potential customers and/or end-users: | Researchers. |
| Competitive solutions: | UCAM has not identified any current competitors regarding this project result. |
| Barriers: | UCAM has not named any barriers regarding this exploitable output. |

3.3.4.2 Guidelines and recommendations

Following, the input provided by the REXUS partners on the market analysis for the exploitable results that were categorized as “Guidelines and recommendations” is provided.

- PSDM guidelines for replication (IRSA)
- A simulation game providing visualization of policy impacts for decision makers and wider stakeholders (UCAM)
- Practical guidelines for effective stakeholder engagement (SWRI)
- Critical review of existing Nexus frameworks and frameworks for evaluating adaptation options (WCMC)

- Documentation of REXUS Nature-based Solution Selection Framework including application of visualisation tools adapted for nexus contexts (WCMC)

PSDM guidelines for replication

| | |
|--|---|
| Declared by: | IRSA |
| Relevant WP/Task/Deliverable: | WP4, Task 4.2, D4.2 “Framework for PSDM implementation in REXUS case studies”. |
| Potential markets: | IRSA has not identified any potential market regarding this exploitable output. |
| Potential customers and/or end-users: | National and regional public authorities as well as policy makers could benefit from guidelines based on real experiences on how System Thinking and PSDM can help better understand and map Nexus systems in different contexts. |
| Competitive solutions: | IRSA has not identified any current competitors regarding this project result. |
| Barriers: | The main barrier is the need for a solid knowledge base on SDM principles and some modelling skills. Additional barriers might be related to the usual challenges of participatory processes. |

A simulation game providing visualization of policy impacts for decision makers and wider stakeholders

| | |
|--|---|
| Declared by: | UCAM |
| Relevant WP/Task/Deliverable: | WP4, Task 4.4, D4.7 “A simulation game providing visualization of policy impacts for decision makers and wider stakeholders”. |
| Potential markets: | UCAM has not identified any potential market regarding this exploitable output. |
| Potential customers and/or end-users: | Policy makers and practitioners to support policy and decision-makers. |
| Competitive solutions: | UCAM has not identified any current competitors regarding this project result. |
| Barriers: | The probable need of a specialist facilitator to run the game. |

Practical guidelines for effective stakeholder engagement

| | |
|--|--|
| Declared by: | SWRI |
| Relevant WP/Task/Deliverable: | This exploitable output does not link to any specific Work Package, Task or Deliverable of REXUS. |
| Potential markets: | Consulting services on NEXUS-based resources management strategies or any other sector in need of participatory approach tools. |
| Potential customers and/or end-users: | Policy makers as well as national and regional public authorities, or any other body in need of participatory actions. Policy makers and public authorities (e.g. ministry of agriculture, ministry of environment, water directorates) need integrated solutions and strategies that are not able to develop with their employees. The aim of this result is to provide useful strategies of high implementation potential for decision making. |
| Competitive solutions: | SWRI has not identified any current competitors regarding this project result. In specific SWRI has clarified that several scientific oriented handbooks and scientific papers on performing participatory approaches, that act complementary to the practical handbook based on real cases studies deployed in the framework of REXUS exist. Nevertheless, there are not any real competitive solutions to according to SWRI's knowledge. |
| Barriers: | SWRI has not identified any barriers regarding this exploitable output. |

Critical review of existing Nexus frameworks and frameworks for evaluating adaptation options

| | |
|--|---|
| Declared by: | WCMC |
| Relevant WP/Task/Deliverable: | WP5, Task 5.4, D5.5 "Documentation of REXUS Nature based Solution Selection Framework including application of visualisation tools adapted for nexus contexts". |
| Potential markets: | Environmental consulting services market. |
| Potential customers and/or end-users: | Policy makers and public authorities (e.g. ministry of agriculture or water secretariats), farmers, water management authorities, who do not necessarily understand the complex interactions. The aim is to provide them with an evidence-based framework that helps identify the potential for using nature-based approaches in addition to traditional approaches in decision-making. Furthermore, this project result could be beneficial to the academic sector that focuses on NEXUS related research. |
| Competitive solutions: | WCMC has not identified any current competitors regarding this project output. |

Barriers: Lack of understanding of the benefits/ resistance to the use of NbS.

Documentation of REXUS Nature-based Solution Selection Framework including application of visualisation tools adapted for nexus contexts

Declared by: WCMC

Relevant WP/Task/Deliverable: WP5, Task 5.4, D5.5 “Documentation of REXUS Nature based Solution Selection Framework including application of visualisation tools adapted for nexus contexts”.

Potential markets: Although WCMC has not identified a market regarding this exploitable result, the Nature based Solutions market would be suitable for this exploitable output.

Potential customers and/or end-users: The framework could be used by decision-makers, e.g. policy makers and public authorities, from the water, food, and energy sectors to increase their climate resilience and find nature-based options for climate change adaptation. These could help maintain the productivity and functioning of these sectors in the face of climate change.

Competitive solutions: WCMC has not identified any current competitors regarding this project output.

Barriers: Lack of understanding of the benefits/ resistance to the use of NbS.

3.3.4.3 Skills and know-how

Following, the input provided by the partners on the market analysis for the exploitable results that were categorized as “Skills and know-how” is provided.

- Carbon and energy footprint (CIRCE)
- Land Use map of agricultural crops (UCLM)
- Water accounting and footprint (UCLM)
- Land use suitability (UCLM)
- Development of NEXUS based management strategies on the basin scale (SWRI)
- Fit-for-Nexus Climate Risk Assessments (DRAXIS)

Carbon and energy footprint

Declared by: CIRCE

| | |
|--|--|
| Relevant WP/Task/Deliverable: | WP3, Task 3.3, D3.6 “Report on energy and carbon accounting and footprints results_ Final version”. |
| Potential markets: | CIRCE has not identified a potential market regarding this exploitable result. |
| Potential customers and/or end-users: | Policy makers. |
| Competitive solutions: | CIRCE have stated that they have identified the existence of competitive solutions regarding their exploitable output, but they have not provided any clarifications or specifications of them. |
| Barriers: | Inaccessibility and privacy of data due to the politics on the construction/development/policies of the country pilots may have: either lost the data, be truly private (a work on an NDA is being discussed, plus working on estimations as mitigation plan). |

Land Use map of agricultural crops

| | |
|--|--|
| Declared by: | UCLM |
| Relevant WP/Task/Deliverable: | WP3, Task 3.4, D3.8 “Land-use suitability mapping tool using EO based indicators_ Final version”. |
| Potential markets: | Nature based solutions market. Specifically water management. |
| Potential customers and/or end-users: | Policy makers as well as national and regional public authorities e.g. ministry of agriculture. ministry of environment, water directorates. |
| Competitive solutions: | Solutions based on field work integrated on traditional Geographic Information Systems. |
| Barriers: | UCLM has not named any barriers regarding this project result. |

Water accounting and footprint

| | |
|--------------------------------------|---|
| Declared by: | UCLM |
| Relevant WP/Task/Deliverable: | WP3, Task 3.2, D3.4 “Water accounting and footprint: methodologies and results_ Final version”. |

| | |
|--|--|
| Potential markets: | Environmental consulting services market. Specifically, consulting services on NEXUS-based resources management strategies (or any other sector in need of participatory approach tools). |
| Potential customers and/or end-users: | Policy makers as well as national and regional public authorities e.g. ministry of agriculture. ministry of environment, water directorates need integrated solutions and strategies that are not able to develop with their employees. The aim is to provide useful strategies of high implementation potential for decision making. |
| Competitive solutions: | UCLM has stated that there are no real competitive solutions to their knowledge. They have clarified the existence of several scientific oriented handbooks and scientific papers on performing participatory approaches, that act complementary to the practical handbook based on real cases studies deployed in the framework of REXUS. |
| Barriers: | UCLM has not named any barriers regarding this project result. |

Land use suitability

| | |
|--|---|
| Declared by: | UCLM |
| Relevant WP/Task/Deliverable: | WP3, Task 3.4, D3.8 “Land-use suitability mapping tool using EO based indicators_ Final version”. |
| Potential markets: | Environmental consulting services market. Specifically, consulting services on NEXUS-based resources management strategies (or any other sector in need of participatory approach tools). |
| Potential customers and/or end-users: | Policy makers as well as national and regional public authorities e.g. ministry of agriculture. ministry of environment, water directorates need integrated solutions and strategies that are not able to develop with their employees. The aim is to provide useful strategies of high implementation potential for decision making. |
| Competitive solutions: | UCLM has stated that there are no real competitive solutions to their knowledge. It has clarified the existence of several scientific oriented handbooks and scientific papers on performing participatory approaches, that act complementary to the practical handbook based on real cases studies deployed in the framework of REXUS. |
| Barriers: | UCLM has not named any barriers regarding this project result. |

Development of NEXUS based management strategies on the basin scale

| | |
|--------------------------------------|---|
| Declared by: | SWRI |
| Relevant WP/Task/Deliverable: | This result does not correlate to a specific Work Package, Task or Deliverable. |

| | |
|--|--|
| Potential markets: | Environmental consulting services market. Specifically, consulting services on NEXUS-based resources management strategies. |
| Potential customers and/or end-users: | Policy makers as well as national and regional public authorities e.g. ministry of agriculture, ministry of environment, water directorates that need integrated solutions and strategies that are not able to develop with their employees. The aim is to provide useful strategies of high implementation potential for decision making. |
| Competitive solutions: | SWRI has stated that there are no real competitive solutions to its knowledge. The state that solutions on integrating all NEXUS aspects in an integrated way, such as developed in the context of REXUS project are not met on the market so far. Nevertheless, the necessity of having integrated solutions is high. |
| Barriers: | SWRI has not named any barriers regarding this project result. |

Fit-for-Nexus Climate Risk Assessments

| | |
|--|---|
| Declared by: | DRAXIS |
| Relevant WP/Task/Deliverable: | WP3, Task 3.1, D3.2 “Data Integration and Visualisation: strategy and results_ Final version”. |
| Potential markets: | Environmental consulting services market. Specifically, consulting services on climate risk assessment. |
| Potential customers and/or end-users: | Policy makers as well as national and regional public authorities. Policy makers and public authorities (e.g. ministry of agriculture or water secretariats) who do not necessarily understand the complex interactions. The aim of DRAXIS is to educate them and ultimately identify suitable policy schemes and management measures. |
| Competitive solutions: | DRAXIS has stated that there are no real competitive solutions to its knowledge. Climate impact assessment usually look at specific sectors, i.e. water alone (e.g. impact of precipitation or flooding) and/or at simple indicators (e.g. heat stress) without taking into account the impacts to the Nexus sectors and/or the exposure, vulnerability and adaptive capacity of the sector. This type of service may be more economic however our result may provide better support for well informed decision making. |
| Barriers: | DRAXIS has not named any barriers regarding this project result. |

3.4 Exploitation pathways

In this section the available pathways that the REXUS partners may follow for the exploitation of their results, are presented. It is worth highlighting that the selection of the individual exploitation pathways will be documented in the final version of this deliverable (Deliverable 7.6) which will be submitted by the end of the project.

The exploitation pathways are closely related to the selected pathway for the commercialization of IP, in view of future profits and business growth. It is certainly not an easy task to manage IP commercialisation as the success of this process depends on several internal and external factors such as business objectives, type of IP as well as economic and intellectual resources. In addition, since IP can be commercialized either directly by its owner, through an assignment/transfer or by building up business partnerships, the selection of the most appropriate tool is often challenging (European Commission, 2019c). There are various ways of commercializing an Intellectual Property assets, as shown in Figure 14.

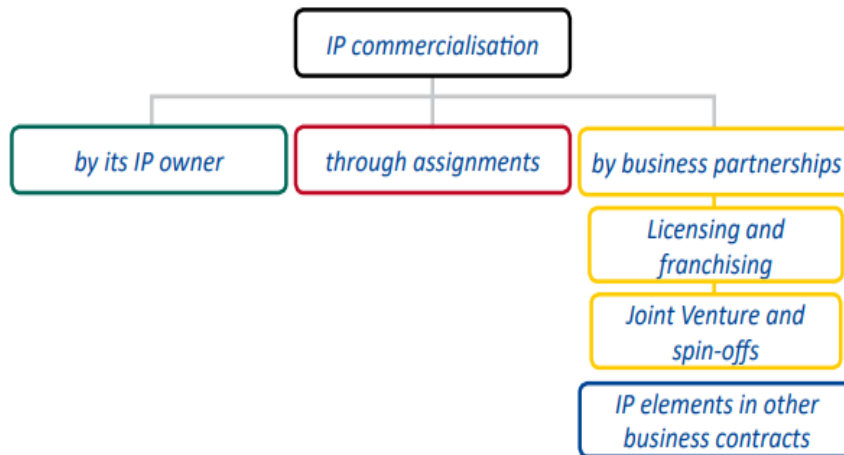


Figure 14: IP Commercialisation pathways (Source: EU Commission, 2019c).

Following, more information with respect to each commercialization pathway is provided.

IP commercialisation by its owner

Regardless of the industry domain, whether in manufacturing or the services sector, businesses create, develop and sell intangible assets. How to carry out commercialisation activities, whether by the company itself or not, is a question of corporate culture and business strategy. Entities like companies, universities and institutes may want to take up commercialisation activities on their own for different reasons, for example when a company already has enough capabilities for marketing, so that there is no need for partnership. Another reason could be that they do not have enough capacities for building up and/or carrying out such a partnership or they hesitate to share information with third parties and do not want to create possible competitors or spend money and make an effort to building partnerships (European Commission, 2019c).

Transfer/Assignment of results

The transfer/assignment of a project result is foreseen in the REXUS' Grant Agreement – Article 30: “Transfer and licensing the results”. Specifically, REXUS partners, as any other partner participating in Horizon Europe projects, may transfer ownership of their results and so, the ownership of IP is permanently moved from one party (the assignor) to another party (the assignee). Consequently, the assignee becomes the new owner of the IPR.

The advantages of a permanent assignment are the availability of immediate cash flow return to be potentially invested in further R&D activity. On the other hand, a transfer/assignment causes the loss of control over the IPR. An assignment could also be non-beneficial in terms of socio-economic benefits if the assignee does not have the skilled employees or the established business network to valorize it (European Commission, 2014).

Granting licenses

Another way of getting commercial value out of a result is through the process of granting a license. A license is a contract under which the holder of an intellectual property (licensor) grants permission for the use of its intellectual property to another person (licensee), within the limits set by the provisions of the contract. In essence, when a licensor grants a license to a licensee, regarding a project result, he/she gives them the permission and the right to exploit it. Licensing has a vital role in companies' commercialization strategies, since there are significant advantages of licensing IP, creating a win-win situation for both parties (European Commission, 2019c).

Table 5: Benefits of licensing for both parties (Source: EU Commission, 2019c).

| For Licensor | For Licensee |
|--|--|
| Opportunity to reach new markets with existing products/ services. | Opportunity to create new businesses. |
| Opportunity to enter a market with existing clientele of the licensee, which reduces risks for market failure. | Opportunity to provide licensor's already available/well established products/services to the clients, which reduces risks for market failure. |
| No need to invest in marketing and distribution. | No need to invest on R&D. |
| The licensor retains ownership of the IP while receiving royalty income from it. | The licensee does not need to "purchase" the IP and use the opportunity to test market success of the licensed product/service without investing much. |
| Licensing is a means for turning a possible competitor into a partner. | |

Joint Ventures

Another common means of IP commercialisation is Joint Ventures (JV). It is a situation where scientists and private companies commit resources and research efforts to projects, together and may be co-funded. Additionally, when business alliances of two or more independent entities (e.g. organisations, venturers) undertake a specific project or reach a certain goal, they will share the risks, as well. Many times, a Joint ownership leads to a Joint Ventures among several partners. Moreover, IP has an important role in the creation of such collaborations, where all parties should contract and agree on their initial contributions, their obligations within the alliance as set out in JV agreements, as well as, the specific tasks for which they will be in charge, since venturers bring their own intellectual assets for the success of a JV (European Commission, 2019c; European Commission, 2014).

Spin-offs

Another frequent derivative of the collaboration between two or more partners is a **Spin-off**. Spin-offs (or spin-outs) are separate legal entities created by a parent organisation (PO) to bring its IP assets into the market. In general, it is an efficient solution for the parent organisations, who may not be fully able to commercialize their own IP assets, for example universities and research institutions. Spin-offs are seen as a valuable means of technology transfer since they are acting as an intermediary between the research sector and industries while

putting research results into the commercial market in the form of a commercial product. Moreover, through spin-offs, research organisations can focus on their main task of “research” instead of “marketing”, which is the main task of spin-off companies (European Commission, 2019c).

Consultancy

A consultancy contract is a form of IP commercialisation in business contracts which comprises contract research and/or faculty consulting. The first channel consists of a research commissioned by a private company to pursue a solution to a problem of interest, while faculty consulting encompasses research or advisory services provided by researchers to industry clients. This is one of the most widespread activities in which industry and academics engage. Three different types of consulting are normally offered: research-, opportunity- and commercialisation-driven consulting. This channel is very important to industry and usually does not compromise university objectives (European Commission, 2014).

4 Sustainability plan

The second integral part of this deliverable is related to the plan for the sustainability of the project results after the project end. This consists of the actions related to:

- The implementation and/or continuation of a project result at the pilot areas after the project end
- The continuation/maintenance and the dissemination of project results after the project end

In the following sections, information is provided with respect to the identified sustainability actions for the two types of actions.

4.1 Implementation/continuation of project results at the pilot areas

This section of the deliverable focuses at the project partners that are responsible for the pilot areas of REXUS, namely AAWA (Isonzo pilot), CIAT (Nima pilot), GEOECOMAR and WWF Ro (Danube pilot), SWRI (Pinios pilot) and AGRISAT (Spain pilot). **¡Error! No se encuentra el origen de la referencia.** indicates the number of results that will be continued beyond the project in each REXUS pilot area, their main targeted end-user group, the foreseen timeline of future continuation of these results and whether there have been identified any barriers for the sustainability of the project results at the pilot areas.

Table 6: Input declared by pilot leaders

| Pilot leader and area | Number of results that will be maintained | Main stakeholder group | Estimated time period for implementation of activities | Identification of barriers |
|-------------------------------------|---|-------------------------------|--|----------------------------|
| AAWA (Isonzo pilot) | 17 | Authorities and policy makers | More than 5 years | Yes |
| CIAT (Nima pilot) | 3 | Civil society | N/A | Yes |
| SWRI (Pinios pilot) | 6 | Authorities and policy makers | 2 years | Yes |
| GEOECOMAR and WWF Ro (Danube pilot) | 4 | Authorities and policy makers | More than 5 years | No |
| AGRISAT (Spain pilot) | 6 | Authorities and policy makers | 1-3 years | Yes |

According to **¡Error! No se encuentra el origen de la referencia.**, the number of the project results that are foreseen to be continued in the pilot areas of REXUS is thirty-six. The vast majority of pilots aim to continue the implementation of three to six project results, with the exception of the Isonzo pilot that plans to make use of the total (17) of the REXUS outputs referring to the Isonzo pilot area. Four pilot leaders have identified as their main target end users, public authorities and policy makers that are involved in the Water-Energy-Food (WEF) nexus, both at a national and local scale, such as ministries, local municipalities and environmental management authorities. Lastly, one pilot leader stated that their end-user is the civil society.

Two of the pilot leaders plan to continue implementing the activities for more than five years after the end of the project, other two partners for approximately two years, while one of the pilot partners was not able to provide an estimation at that stage. Last but not least, 80% (4) of the pilot leaders have identified obstacles for the implementation/continuation of the project results at their pilot area. Specifically, one of the main obstacles that was identified by the pilot leaders of the project is that policies related to the WEFC Nexus are currently fragmented at the sector and geographical level. In detail, convincing public authorities and policy makers to consider and ultimately adopt some of the project’s results is difficult. In addition, the pilot leaders have referred to the unavailability of data, as barriers that could hinder the sustainability of REXUS. Last but not least, some consortium members have stated that the lack of funding could endanger the future continuation of a project result.

4.1.1 Input declared by pilot partners

This sub-section focuses on the input that was provided by the REXUS pilot leaders and presents in detail the project results that will be maintained beyond the project in each pilot area, the ultimate aim, the potential stakeholders, as well as the barriers that would hinder future sustainability actions.

4.1.1.1 AAWA (Isonzo-Soča river basin pilot)

| AAWA (Isonzo-Soča river basin pilot) | |
|---|---|
| <u>Project result(s) that will be maintained after the end of the project:</u> | All the results generated from the deliverables of WP3, WP4, WP5 and WP6. |
| Partners that should be involved: | AAWA in collaboration with all the technical partners involved in WP3, WP4, WP5 and WP6. |
| Ultimate aim: | Develop a comprehensive approach at basin scale, shared amongst stakeholders, to support an integrate management of the water resources and of the flood risk, including its nexuses with agriculture, energy production and ecosystem preservation. Develop common vision and Strategies for the Isonzo basin between Italy and Slovenia. Strengthen the collaboration and cooperation between the two nations and the WEF stakeholders. |
| Potential stakeholders: | Public authorities, local government (municipalities etc.), ministry of environment. Also WFE stakeholders (public and private sector). |
| Stakeholder benefits and impact: | Environmental datasets that could help AAWA's activities in Isonzo Basin. New approaches that, if successfully tested in REXUS, may be extended to other areas of the Oriental Alpes river district. Definition with the stakeholders’ new measures and strategies for flood risk management that could be integrated in the next iteration of the flood risk management plan. |
| Barriers: | Institutional Fragmentation between Italy and Slovenia. Fragmentations in roles and competences between WFE Nexus actors. |
| Necessary activities after the project’s end: | Eventual extension of some of the REXUS solutions and approaches to other Unit of Management of the Oriental Apes River District. |

Estimated time period: More than five years.

4.1.1.2 CIAT (Nima sub-watershed pilot)

CIAT has identified three results that aims to maintain after the end of the project. These are analyzed below.

| CIAT (Nima sub-watershed pilot) | |
|--|---|
| <u>Project result no1:</u> | “Roadmap to navigate the available catalogues of EbA solutions and a finalised list of candidate EbA solutions”. |
| Relevant WP/Task/Deliverable | WP5, Task 5.2, D5.2 “Roadmap to navigate the available catalogues of EbA solutions”. |
| Partners that should be involved: | CIAT and ETIFOR SRL. |
| Ultimate aim: | The ultimate aim will be implementing some of the NBS proposed in the portfolio to face the environmental necessities in the Nima watershed. |
| Potential stakeholders: | Civil society, public authorities and policy makers. |
| Stakeholder and impact: | benefits The local authorities will be provided with a portfolio with potential Natural based solutions (NbS) to face the environmental necessities in the Nima watershed and a finalised list of candidate EbA solutions. It is expected that the implementation of NBS will improve the management of natural resources in the area and consequently be reflected in the life quality of local communities. |
| Barriers: | Identified barriers could be the conflicts between local communities and sugar cane sector, paper production companies, companies in the livestock sector. |
| Necessary activities after the project’s end: | Activities will depend on the NbS that will be implemented in the area. |
| Estimated time period: | Not identified. |
| <u>Project result no2:</u> | “A document with an environmental participative diagnostic identifying the main environmental problems, necessities, and solutions at the Nima sub watershed from the actor’s point of view”. |
| Relevant WP/Task/Deliverable | Not available. |

| | |
|--|---|
| Partners that should be involved: | CIAT |
| Ultimate aim: | The objective is to obtain a vision of the main necessities and portfolio on NBS of the Nima sub-watershed. |
| Potential stakeholders: | Public authorities such as rural community councils, regional environmental authorities and rural aqueducts councils. Private sector, specifically the sugar sector, local companies in the livestock sector and companies of energy production. Civil society. |
| Stakeholder and impact: | benefits It is expected that the environmental participative diagnosis allows the production of the portfolio of NBS. These solutions will be the base to write proposals to search funding to be implemented. These projects could improve the management of natural resources in the area, that will be reflected in the life quality of local communities. |
| Barriers: | Identified barriers could be the conflicts between local communities and sugar cane sector, paper production companies and companies in the livestock sector. |
| Necessary activities after the project's end: | Socialize and give a document about the environmental participative diagnostic identifying the main environmental problems, necessities, and solutions at the Nima sub watershed from the actor's point of view to the municipality of Palmira, regional environmental authorities and rural community councils. |
| Estimated time period: | Not identified. |

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|--|---|
| <u>Project result no3:</u> | "A document with the participative construction of a territorial future vision of the natural resources from Nima sub watershed from the actor's point of view" |
| Relevant WP/Task/Deliverable | Not available. |
| Partners that should be involved: | CIAT |
| Ultimate aim: | The objective is to obtain the future vision of the natural resources at the sub-watershed that incorporate NBS identified during the participative diagnosis. |
| Potential stakeholders: | Public authorities such as rural community councils, regional environmental authorities and rural aqueducts councils. Private sector, specifically the sugar sector, local companies in the livestock sector and companies of energy production. Civil society. |
| Stakeholder and impact: | benefits It is expected that the future vision of the sub-watershed including NBS will be the base to design projects to be implemented. These projects could improve the management of natural resources in the area, that will be reflected in the life quality of local communities. |
| Barriers: | Identified barriers could be the conflicts between local communities and sugar cane sector, paper production companies and companies in the livestock sector. |

| | |
|--|--|
| Necessary activities after the project's end: | Socialize and give a document about the future vision of the natural resources at the sub watershed to the municipality of Palmira, regional environmental authorities and rural community councils. |
| Estimated time period: | Not identified. |

4.1.1.3 GEOECOMAR and WWF Ro (Lower Danube river basin pilot)

GEOECOMAR and WWF Ro have identified five results that they aim to maintain after the end of the project. These are analyzed below.

| GEOECOMAR in collaboration with WWF Ro (Lower Danube river basin pilot) | |
|---|--|
| <u>Project result(s) that will be maintained after the end of the project:</u> | <ol style="list-style-type: none"> 1. "PSDM scenarios in pilots", 2. "Climate risk assessment results in pilots", 3. "Application of NbS selection framework in pilots", 4. "Pilot validation report and adoption roadmap" and "REXUS synthesis products". |
| Relevant WP/Task/Deliverable: | WP6, Task 6.2.2, D6.3 "PSDM scenarios in pilots", Task 6.2.3, D6.4 "Climate risk assessment results in pilots", Task 6.3, D6.5 "Application of NbS selection framework in pilots", Task 6.4, D6.6 "Pilot validation report and adoption roadmap" and Task 6.5, D6.7 "REXUS synthesis products_ Final version". |
| Partners that should be involved: | GEOECOMAR, WWF Ro, UCAM, DRAXIS, WCMC, UCLM, AGRISAT. |
| Ultimate aim: | Promote the sustainable exploitation of natural resources while encouraging inter-institutional cooperation. |
| Potential stakeholders: | Public authorities, policy makers, public sector, private sector and researchers. |
| Stakeholder benefits and impact: | No potential benefits of the targeted stakeholders were mentioned by GEOECOMAR. |
| Barriers: | Maintain a dynamic balance between the development of human activities, industry and the natural environment in the Danube Basin. |
| Necessary activities after the project's end: | Future collaborations with local/regional municipalities, policy makers, Romania Waters National Authorities, Lower Danube River Administration. |
| Estimated time period: | More than five years. |

4.1.1.4 SWRI (Pinios river basin pilot)

SWRI has identified six project results that plans to continue implementing after the end of the project. These are analyzed below.

| SWRI (Pinios river basin pilot) | |
|--|---|
| <u>Project result no1:</u> | “REXUS observatory contents in pilots”. |
| Relevant WP/Task/Deliverable | WP6, Sub-Task 6.2.1, D6.2 “REXUS observatory contents in pilots”. |
| Partners that should be involved: | SWRI and UCLM. |
| Ultimate aim: | Update data related to the pilot. This would provide high quality, updated data to the research community and the stakeholders. |
| Potential stakeholders: | This data can be used by a wide variety of stakeholders such as researchers, policy makers and researchers. |
| Stakeholder benefits and impact: | High quality data is the basis for establishing reliable studies for all sectors. |
| Barriers: | Copyright of data and funding. |
| Necessary activities after the project’s end: | Contribution of the involved partners. |
| Estimated time period: | Two years. |
| <u>Project result no2:</u> | “Water accounting and footprint: methodologies and results”. |
| Relevant WP/Task/Deliverable | WP3, Task 3.1, D3.2 “Data Integration and Visualisation: strategy and results_ Final version”. |
| Partners that should be involved: | SWRI, UCLM, AGRISAT and DRAXIS. |
| Ultimate aim: | Provide data to the policy makers for water resources management and strategic development. |
| Potential stakeholders: | Regional and national water authorities and municipalities. |

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| Stakeholder benefits and impact: | Having an updated water accounting and footprint estimation for the basin will provide updated insight on water resources management of the basin. This data could contribute significantly to the revision of the basins' Water Resources Management Plan developed in the context of WFD2000/60 implementation. |
| Barriers: | Adoption by the authorities and funding. |
| Necessary activities after the project's end: | Collaboration with the relevant authorities, contribution of the involved partners. |
| Estimated time period: | Two years. |

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|--|--|
| <u>Project result no3:</u> | “PSDM scenarios in pilots”. |
| Relevant WP/Task/Deliverable | WP6, Task 6.2.2, D6.3 “PSDM scenarios in pilots”. |
| Partners that should be involved: | SWRI, UCAM, WCMC, DELTARES, ICATALIST, IRSA. |
| Ultimate aim: | Adopt and follow a methodological framework to co-design management scenarios. |
| Potential stakeholders: | Public authorities. |
| Stakeholder benefits and impact: | Co-developing the appropriate scenarios with key stakeholders will enhance NEXUS oriented management of the system for the first time in the country. Implementation of the WFD and reach a consensus for the management of the system, hence having higher chances of measures' implementation. |
| Barriers: | Convincing the authorities involved to adopt, acceptance by stakeholders. |
| Necessary activities after the project's end: | Collaboration with the relevant authorities, contribution of the involved partners, promotion of the virtues of the project and communication of the necessity to implement the methodologies. |
| Estimated time period: | Two years. |

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| <u>Project result no4:</u> | “Application of NbS selection framework in pilots”. |
| Relevant WP/Task/Deliverable | WP6, Task 6.3, D6.5 “Application of NbS selection framework in pilots”. |
| Partners that should be involved: | SWRI, UCAM, WCMC, DELTARES, ICATALIST, IRSA. |
| Ultimate aim: | Adopt and apply a safe approach in selecting meaningful management solutions. |
| Potential stakeholders: | Regional and national water authorities, municipalities. |

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| Stakeholder benefits and impact: | For the pilot area and beyond, knowledge of the methodological framework to evaluate the outcomes of alternative solutions within the REXUS Solutions Selection Framework will allow for meaningful and efficient strategic planning. The implementation of the WFD combined with the selection of appropriate measures will satisfy ,to the highest possible degree, the needs of stakeholders. |
| Barriers: | Convincing the authorities involved to adopt, acceptance by stakeholders. |
| Necessary activities after the project's end: | Collaboration with the relevant authorities, contribution of the involved partners, promotion of the virtues of the project and communication of the necessity to implement the methodologies. |
| Estimated time period: | Two years. |

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| <u>Project result no5:</u> | “Land-use suitability mapping tool using EO-based indicators”. |
| Relevant WP/Task/Deliverable | WP3, Task 3.2, D3.4 “Water accounting and footprint: methodologies and results_ Final version”. |
| Partners that should be involved: | SWRI, UCLM, AGRISAT. |
| Ultimate aim: | Provide data to the policy makers for landscape management and agricultural development. |
| Potential stakeholders: | Public authorities such as ministries and municipalities. |
| Stakeholder benefits and impact: | Having updated data on land use would be very useful from the policy perspective. The land suitability maps of the optimum varieties that will be produced, and the guidelines for sustainable farming practices, land and water management will be very useful for a wide variety of actors. |
| Barriers: | Adoption by the authorities and funding. |
| Necessary activities after the project's end: | Collaboration with the relevant authorities, contribution of the involved partners. |
| Estimated time period: | Two years. |

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| <u>Project result no6:</u> | “Finalised core modules for decision support framework”. |
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| Relevant WP/Task/Deliverable | WP5, Task 5.3, D5.3 Finalised core modules for decision support framework”. |
| Partners that should be involved: | SWRI, DELTARES. |
| Ultimate aim: | Provide stakeholders with a flexible interact to assess impact of solution selection on various indicators and criteria. |
| Potential stakeholders: | Public authorities. |
| Stakeholder benefits and impact: | This meta model will help them with the dialogue with other stakeholders. Furthermore, it provides better system understanding and the potential for selected EbA/NbS measures. |
| Barriers: | No barriers were identified. |
| Necessary activities after the project’s end: | Not available yet. |
| Estimated time period: | Not available yet. |

4.1.1.5 AGRISAT (Peninsular Spain pilot)

AGRISAT has identified six project results that they plan to continue implementing after the end of the project. These are analyzed below.

| AGRISAT (Peninsular Spain pilot) | |
|--|---|
| <u>Project result no1:</u> | “Water accounting and footprint: methodologies and results”. |
| Relevant WP/Task/Deliverable | WP3, Task 3.2, D3.4 Water accounting and footprint: methodologies and results_ Final version”. |
| Partners that should be involved: | AGRISAT, UCLM. |
| Ultimate aim: | The ultimate goal is to contribute to the country's challenges, such as overcoming institutional fragmentation and thus improving understanding between regions and watersheds. |
| Potential stakeholders: | Public sector. More specifically, the primary beneficiaries will be the river basins and entities involved in the water domain. |
| Stakeholder benefits and impact: | The benefits will be to have a scientific basis for decision making. Water accounting in Spain is fundamental because water resources are unequal. |
| Barriers: | Not available at this stage of the project. |

Necessary activities after the project's end: Contribution of the involved partners.

Estimated time period: Three years.

Project result no2: “Land-use suitability mapping tool using EO based indicators”.

Relevant WP/Task/Deliverable WP3, Task 3.4, D3.8 “Land-use suitability mapping tool using EO based indicators_ Final version”.

Partners that should be involved: AGRISAT, UCLM.

Ultimate aim: The ultimate goal is to contribute to the country's challenges, such as overcoming institutional fragmentation and thus improving understanding between regions and watersheds.

Potential stakeholders: Researchers, private sector, public sector, civil society. In essence, the methodologies will be utilized by researchers, but the ultimate end-user will be the public sector, private sector and farmers to a greater extent.

Stakeholder benefits and impact: The benefits of the end-users will be the soil analysis that allows the prior evaluation of the use of soils.

Barriers: Not available at this stage of the project.

Necessary activities after the project's end: Strategies in conjunction with the different basin authorities and especially with stakeholders that are involved in agriculture domains.

Estimated time period: Three years.

Project result no3: “Guidelines for PSDM replication of REXUS approach”

Relevant WP/Task/Deliverable WP4, Task 4.2, D4.3 “Guidelines for PSDM replication of REXUS approach”.

Partners that should be involved: AGRISAT, IRSA.

Ultimate aim: The ultimate goal is to contribute to the country's challenges, such as overcoming institutional fragmentation and thus improving understanding between regions and watersheds.

Potential stakeholders: Policy makers and public authorities.

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| Stakeholder benefits and impact: | PSDM will be in charge of analyzing the difficulties and priorities. This will provide a scientific basis to facilitate and help create policies and prioritize those measures. The impact of having a solid foundation will be fundamental and positive for the development of nexus policies. Furthermore, this will aid to the prioritization of measures to be taken at the basin level. |
| Barriers: | Not available at this stage of the project. |
| Necessary activities after the project's end: | Consultations about the methodology with IRSA experts and the analyzation of the results. |
| Estimated time period: | Two years. |

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|--|--|
| <u>Project result no4:</u> | "Coupled resource stock-flow systems model". |
| Relevant WP/Task/Deliverable | WP4, Task 4.3, D4.5 "Coupled resource stock flow systems model". |
| Partners that should be involved: | AGRISAT, UCAM. |
| Ultimate aim: | The ultimate goal is to contribute to the country's challenges, such as overcoming institutional fragmentation and thus improving understanding between regions and watersheds. |
| Potential stakeholders: | Policy makers and public authorities. UCAM will carry out an analysis at the national level. The beneficiaries will be stakeholders dealing with national issues. |
| Stakeholder benefits and impact: | UCAM will carry out an analysis at the national level. This analysis gives a clear vision of the situation in Spain while having a wide scale. Other benefits will be the understanding of the main problems of the nexus. |
| Barriers: | Not available at this stage of the project. |
| Necessary activities after the project's end: | Consultations on the results and perhaps participatory meetings with policymakers. |
| Estimated time period: | One year. |

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|-----------------------------------|--|
| <u>Project result no5:</u> | "REXUS Nature-based Solution Selection Framework including application of visualisation tools adapted for nexus contexts" |
|-----------------------------------|--|

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|--|---|
| Relevant WP/Task/Deliverable | WP5, Task 5.4, D5.5 Documentation of REXUS Nature based Solution Selection Framework including application of visualisation tools adapted for nexus contexts”. |
| Partners that should be involved: | AGRISAT, WCMC. |
| Ultimate aim: | The ultimate goal is to contribute to the country's challenges, such as overcoming institutional fragmentation and thus improving understanding between regions and watersheds. |
| Potential stakeholders: | Researchers, public authorities, civil society. |
| Stakeholder benefits and impact: | The benefits will be the understanding of NEXUS solutions that could lead to their implementation. In addition, this knowledge could ultimately pass from researchers and institutions like AGRISAT to society. |
| Barriers: | Not available at this stage of the project. |
| Necessary activities after the project’s end: | Consultations on the methodology of NbS implementation. Close collaboration with the relevant stakeholders. |
| Estimated time period: | Two years. |
| <u>Project result no6:</u> | “Energy and carbon accounting and footprints results”. |
| Relevant WP/Task/Deliverable | WP3, Task 3.3, D3.6 “Report on energy and carbon accounting and footprints results_ Final version”. |
| Partners that should be involved: | AGRISAT, CIRCE. |
| Ultimate aim: | Provide data to the decision makers. |
| Potential stakeholders: | Public authorities like ministries and confederations and policy makers. |
| Stakeholder benefits and impact: | This data could be useful to MITECO, especially for the energy office. |
| Barriers: | The need to convince the different authorities involved to adapt their methodology and their plans. |
| Necessary activities after the project’s end: | Close communication and collaborations between AGRISAT, CIRCE and the different stakeholders. |
| Estimated time period: | Two years. |

4.2 Continuation/maintenance and dissemination of project results

This section focuses on the input that was declared by the project partners regarding the dissemination of the project results, after the end of REXUS.

Table 7 summarizes the number of project results that each partner aims to disseminate and the foreseen years of dissemination beyond the project’s timeline. As shown in the Table, twenty-nine project results will be continued, maintained or disseminated after the project end. About 60% (8) of the partners plan to disseminate one project result, 15% (2) two results and 23% (3) three to eight results. Regarding the time frame, 30% (4) of the project partners foresee this period to last for three years after the project end, 15% (2) two years, 15 % (2) one year and 15% (2) more than five years, while 25% (3) was not able to provide this information at this stage. It is worth noting that thirteen of the sixteen project partners (81%) aim to contribute to the sustainability of REXUS via the future dissemination of one or more project results.

Table 7: Input declared by partners regarding dissemination after the project end

| Project partners | Number of results | Years after the project end |
|------------------|-------------------|-----------------------------|
| CIRCE | 1 | More than 5 years |
| IRSA | 2 | 2 years |
| ICATALIST | 1 | N/A |
| DELTARES | 1 | N/A |
| GWP-Med | 1 | 2 years |
| UNIPD | 1 | N/A |
| AWWA | 8 | 3 years |
| UCAM | 3 | 1 year |
| UCLM | 2 | 1 year |
| SWRI | 6 | 3 years |
| WCMC | 1 | 3 years |
| GEOECO, WWF ro | 1 | More than 5 years |
| DRAXIS | 1 | 3 years |

A frequent way to disseminate a project result that was chosen by most of the project partners as their preferred means of dissemination is the public disclosure of the REXUS’ results via publications in scientific journals and participation in relevant conferences. Other activities that were selected by some partners are data collection in

order to update the project’s databases, update of project related website, payment of annual fee for the maintenance and the continuation of platforms relating to REXUS, promotion on the social media platforms of the project and future collaborations that could publicly disclose and promote the REXUS framework, with the aim to maximize its impact.

4.2.1 Input declared by partners

This sub-section focuses on the input that was declared by the project partners regarding the future dissemination of REXUS results. It includes information with respect to the project activities that will be maintained beyond the end of the project, the chosen means of continuation, the years of continuation and the resources needed for this endeavor.

| CIRCE | |
|---|--|
| Project activities that will be continued: | Carbon and energy footprint. |
| Relevant WP/Task: | WP3, Task 3.3. |
| Means of continuation: | Data collection in order to update the initial data bases. |
| Years of continuation: | More than five years. |
| Resources needed: | Personnel and funding. |
| IRSA | |
| Project activities that will be continued: | PSDM framework. |
| Relevant WP/Task: | WP4, Task 4.2. |
| Means of continuation: | Updating of the website. Transfer of knowledge through publications, participation in conferences. Future collaborations and networking actions. |
| Years of continuation: | Two years. |
| Resources needed: | Additional funding. |
| ICATALIST | |

Project activities that will be continued: REXUS learning platform.

Relevant WP/Task: WP2, Task 2.5.

Means of continuation: Payment of annual fee of Moodle platform. Updating of information on nexus activities by the local LAA.

Years of continuation: Not available at the present time.

Resources needed: Not available at the present time.

DELTARES

Project activities that will be continued: Core modules for decision support framework.

Relevant WP/Task: WP5, Task 5.3.

Means of continuation: Publications and participation in conferences.

Years of continuation: Not available at the present time.

Resources needed: Not available at the present time.

GWP-Med

Project activities that will be continued: Project website & serious games.

Relevant WP/Task: WP7, Task 7.3.

Means of continuation: Technical maintenance of website. Promotion on social media of REXUS communications material on suitable occasions. Publications. Project video that presents the value of the general Nexus & particular REXUS approach and that can be used to promote Nexus management. Project videos, podcasts, pilot factsheets, etc.

| | |
|---|--|
| Years of continuation: | Two years. |
| Resources needed: | Funds to pay for domain name and website hosting, and for technical maintenance. Part-time administrator to upload project related news and promote on social media. |
| UNIPD | |
| Project activities that will be continued: | Socio-economic impacts of WEF Nexus-related ES. |
| Relevant WP/Task: | WP3, Task 3.6. |
| Means of continuation: | Scientific papers, presentations to conferences, and making the outcomes available through the updating of the UNIPD project website. |
| Years of continuation: | Not available at the present time. |
| Resources needed: | Not available at the present time. |
| AAWA | |
| Project activities that will be continued: | All the project activities relating to WP6. |
| Relevant WP/Task: | WP6, Task 6.1 to Task 6.5. |
| Means of continuation: | Transfer of knowledge through publications, participation in conferences, engagement strategies and future collaborations. |
| Years of continuation: | Three years. |
| Resources needed: | Personnel and funding. |
| UCAM | |
| Project activities that will be continued: | Coupled resource stock-flow systems model, WEFC-nexus decision-making on progress towards wider SDG delivery, a simulation game providing visualisation of policy impacts. |

Relevant WP/Task: WP4, Task 4.3.

Means of continuation: Publishing results in Journal papers.

Years of continuation: One year.

Resources needed: Not available at the present time.

UCLM

Project activities that will be continued: Water accounting and footprint, land use suitability.

Relevant WP/Task: WP3, Task 3.2, and Task 3.4.

Means of continuation: Publishing results in Journal papers, participation in conferences and tenement in future collaborations.

Years of continuation: One year.

Resources needed: Not available at the present time.

SWRI

Project activities that will be continued: Any activities related to Pinios pilot.

Relevant WP/Task: SWRI is not responsible for any project task.

Means of continuation: Transfer of knowledge through publications, participation in conferences, future collaborations, updated data provision.

Years of continuation: Three years.

Resources needed: Research scientist (part-time).

WCMC

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| Project activities that will be continued: | Existing Nexus frameworks and frameworks for evaluating adaptation options. |
| Relevant WP/Task: | WP5, Task 5.4. |
| Means of continuation: | Person-months to track the use and feedback on the framework, with the potential to improve it. Provision of resources for hosting and maintenance of the visualization tool. |
| Years of continuation: | Three years. |
| Resources needed: | Person-months for tracking, resources for tool maintenance. |

GEOECOMAR in collaboration with WWF Ro

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|---|--|
| Project activities that will be continued: | Pilot validation and adoption roadmap. |
| Relevant WP/Task: | WP5, Task 5.4. |
| Means of continuation: | Transfer of knowledge, maintenance of the collaboration with stakeholders. |
| Years of continuation: | More than five years. |
| Resources needed: | Personnel. |

DRAXIS

| | |
|---|--|
| Project activities that will be continued: | Fit-for-Nexus Climate Risk Assessments. |
| Relevant WP/Task: | WP3, Task 3.1. |
| Means of continuation: | Provision of resources for hosting the platform in DRAXIS private server and user support. Retrieval of updated information and visualization. |

Years of continuation: Three years.

Resources needed: One system administrator (part-time) and one web developer (part-time).

5 Conclusions

The primary focus of this document is the exploitation and the sustainability of the results generated by the REXUS partners. It displays the project results that were identified by the consortium members that relate to the exploitation of REXUS results along with the IPR considerations that revolve around them. Furthermore, topics such as the potential markets of the exploitable outputs, their end-users and foreseen exploitation barriers that were declared by the project partners are also covered in REXUS Exploitation and Sustainability plan. In addition, the project results and future dissemination activities, that were identified by the project partners and contribute to the sustainability of the project, in conjunction with their end-users and potential sustainability barriers are tackled in this document as well.

Regarding the collection of input from the consortium members, a webinar was organized in order (i) to present the methodological approach for the Exploitation and sustainability plan, (ii) to clarify the definitions of the key terms used in order to achieve a common understanding between partners, as well as (iii) to present the questionnaire developed for capturing the necessary input from partners. The purpose of this questionnaire was to map all project results generated by the REXUS partners in order to estimate the potential for exploitation and to design appropriate exploitation pathways, as well as to ensure the sustainability of non-exploitable results. The questionnaire was circulated among the REXUS partners in order to be filled and returned. Then the input received was evaluated and in the cases that further clarifications or alignment to the established methodology was considered necessary, the partners were contacted for additional feedback via e-mails or one to one meetings.

With respect to the input received by the consortium members, the total number of project results with potential for exploitation, that were declared by the consortium members, is nineteen. There is only one instance of Intellectual Property issue in REXUS and it refers to the utilization of background IP in two project results. However, it is concluded that the stated IP and means of protection will not pose any problem to the exploitation of the results. Furthermore, there is one case of use of third party knowledge, specifically data, in the project's framework which poses a barrier for the further exploitation of the related result. Most project partners stated that they are the sole owners of their exploitable outputs, while the remaining 36% declared that there are other project partners contributing in the generation of the exploitable results. In these cases, an investigation will take place during the second phase, regarding the intentions of the other partners for the exploitation of the results. Almost half of the REXUS exploitable results are jointly owned by several members of the consortium. Therefore, it is of vital importance that during the second phase the involved parties establish a joint ownership agreement, to properly describe their participation and value in this joint effort and agree on issues related to the exploitation and dissemination of the joint results.

According to the input that was declared by the project partners, the markets that could potentially incorporate the exploitable outputs of REXUS are the Environmental Consulting Services market and the Nature based Solutions market. The primary stakeholder groups, that were identified by the consortium members regarding the results of REXUS are policy-makers and public authorities, researchers and the private sector. In addition, the potential obstacles that were classified by the partners of REXUS and could affect the project's exploitation and ultimately its impact, are the regional and sectoral fragmentation regarding policies that relate to the WEFC Nexus, skill shortages regarding some of the project's results, lack of available data and inadequate funding.

Regarding the sustainability plan of REXUS, thirty-six results, are foreseen to be maintained after the end of the project at its pilot areas. The consortium members have identified the main potential stakeholder groups which are public authorities and policy-makers, and researchers. Some barriers that could hinder the continuation of

the project's outputs, according to the partners of REXUS, are the sectoral, geographical and institutional fragmentation regarding policies that relate to the WEFC Nexus, lack of technical knowledge and the unavailability of data.

As far as the sustainability of the project through dissemination of the project's results after its end, is concerned, the number of REXUS outputs that the consortium members plan to disseminate, is twenty-nine. On average, the project partners aim to disseminate their result(s) of choice for a time period of three years and the main means of dissemination that was declared by the consortium members is public disclosure of REXUS' results through publications and/or participation in scientific conferences.

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