LeNa

Ex ante Impact Pathways

A guide to conducting workshops for impact planning

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LeNa Shape – Research with Societal Responsibility

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Preliminary remarks

This guide is meant to assist in the planning and conducting of workshops for the structured definition and planning of impacts and impact pathways for research projects in a forward-looking manner. It describes the underlying steps and suggestions for independent planning and implementation of workshops. The workshops serve both to ensure targeted, impact-oriented project planning and to enable impact planning at an individual project and a programmatic level. The guide draws on a series of workshops conducted in 2023 at the Leibniz Centre for Agricultural Landscape Research (ZALF) and the Leibniz Centre for Tropical Marine Research (ZMT) in the frame of the project LeNa Shape, funded by the German Federal Ministry of Education and Research (BMBF, grant numbers 01UV2110F-G). LeNa Shape addresses sustainability and the societal responsibility of research, and has among its goals to enable researchers in reflecting upon their research activity, including its societal impacts. For more information on the concept of research with societal responsibility and available tools to increase capacity for such research, see the material developed by LeNa Shape (2023, 2024).

The guide contains a description of the different parts of the workshops, a suggested schedule to assist in the time planning, and templates for the creation of whiteboards. The workshops can be conducted both on site and virtually. The use of pre-arranged virtual whiteboards for collaborative work is strongly recommended, particularly if workshops are held virtually. Familiarity with the concepts of societal impacts and impact planning is not required for participants, but workshop organizers and facilitators should have a sound understanding of the underlying concepts and approaches. As a broad literature and a wealth of resources exist for impact planning, this guide does not provide an in-depth background of the methods used, but includes references for further reading.

The workshop series described in this guide has been developed in the context of natural resource use and management. While the general concepts are widely applicable to different research fields, some of the examples and approaches used (e.g., the criteria and indicator sets in workshop 2) will need to be adjusted according to context and research fields.

Introduction

This guide is addressing individuals interested in the systematic assessment and planning of societal impact of research. It is written to assist in the organization and moderation of workshops, and thus should be used as preparatory tool by workshop organizers and facilitators.

The workshop series addresses the planning, or preview, of research, focusing on the setting of goals and the anticipation of societal impact (i.e., an *ex ante* approach; see Blundo Canto et al. 2020). The exercise supports three broad objectives for a project/program:

- Achieving a joint vision
- Reducing (unintended) negative impacts and mitigating trade-offs
- Identifying and enhancing potential positive impacts

Following a brief introduction of the background and aims of the workshop series, the elements of each individual workshop are described along with their rationale. For each workshop, the goal, preparation and content are described. Moderators should carefully read the description of each entire workshop beforehand. Boldface items in the content description reflect the elements of the workshops included in the suggested schedules provided at the end of the manual. Two green boxes provide an overview of relevant theoretical background and details regarding workshop preparation. Additional suggestions for moderators are provided in yellow boxed texts. They are based on our experience with running workshops at our own institutions. Suggested reading and additional resources are listed at the end, and schedules and whiteboard examples for each of the workshop days are provided in the Annex.

Theoretical Background

- **Societal research impact** refers to the "the demonstrable contribution that research makes to the economy, society, environment, or culture, beyond the contribution to academic research" (ARC n.d.). These impacts can be positive, negative, intended and unintended.
- **Impact pathway & narrative**: Research Impact Assessment (RIA) approaches commonly utilize logical frameworks referring to inputs, activities, outputs, outcomes and impacts along an impact pathway. Contributions to impacts can be visualized in impact pathways or conveyed through an impact narrative.
- **Ex ante vs. ex post**: Research impact can be assessed after the conclusion of a research activity (*ex post*), anticipated beforehand (*ex ante*), and monitored during the activity. *Ex post* assessments primarily involve reviewing past or current research activities, their outputs, outcomes, and impacts to construct an impact narrative, account for research impact, and understand enablers or barriers to research impact. Conversely, *ex ante* assessments focus on setting goals and anticipating societal impact ("preview") to plan for impactful research by tracing necessary research activities, collaborations, transfer activities, etc., to achieve agreed-upon goals.
- **Contribution vs. attribution**: There are two approaches to linking research activities to impacts: one focuses on direct attribution, assuming research as a sufficient cause for narrow and specific impacts, while the other assesses contributions to wider societal impacts, considering research activities as necessary but not sufficient factors (Reed et al. 2021).
- **Qualitative impact assessment** involves analyzing descriptive data on the impact (potentials) of research activities and their underlying processes. This analysis is based on methods such as workshops, interviews, and case studies. Unlike quantitative approaches often applied for the accounting of impacts, qualitative assessment focuses on understanding the context and processes rather than solely relying on numerical metrics.

The aim of the consecutive impact pathway workshops is the preview of future research (*ex ante*). The workshops are used to plan for impactful research by focusing on setting relevant goals and the anticipation of societal impact. Further, the workshops backtrack necessary research activities and enablers (impact generating processes) to reach agreed on goals / impact. The workshops can be applied both to the planning and preparation of specific research projects as well as to broader strategic planning at an institutional level, for example in guiding the planning and implementation of programmatic or research focus areas.

The consideration of societal impacts of research is increasingly gaining attention in recent years, particularly in the context of increasing demands for science to contribute to solving pressing sustainability challenges. The generation of societal impact is seen as a responsibility of research towards society. On the one hand, participatory forms of research that integrate not only different academic fields but also research and society, such as transdisciplinary research and citizen science, are becoming more common. At the same time, there is a drive for new, more

integrative ways of assessing scientific excellence and quality, considering societal impact in addition (or even as integral) to academic merit. Research Impact Assessment (RIA) has developed as a distinct field in the past two decades, and additional indicators of scientific quality are identified e.g. in the San Francisco Declaration on Research Assessment (DORA) or sought by initiatives such as the Coalition for Advancing Research Assessments (CoARA).

While traditionally, academic performance is measured using metrics of scientific impact (such as number of publications, amount of funds acquired, or scientometric impact factors), (societal) Research Impact Assessment is an approach to reflect and demonstrate the impact of research beyond the academic world. Systematically anticipating and assessing these societal impacts, as well as the contributions to shared societal objectives and the underlying processes that generate impact, is relatively new, especially within the realm of natural resource management research, and presents significant potential for planning research with impact in mind (Pfeifer and Helming 2024).

As the quantitative attribution of specific societal impacts to a particular research activity is difficult due to the multiple interacting factors jointly contributing to impact (such as specific contexts), many of which are often unknown, the contribution of research to societal impact is regularly described qualitatively. This can be done for example through the use of impact narratives (understood here as a compelling and plausible story describing particular impacts and their achievement, following the project or program's Theory of Change; see Douthwaite et al. 2020) or the tracing of impact pathways (Fig. 1). The qualitative approach to research impact is the one taken in this workshop series.

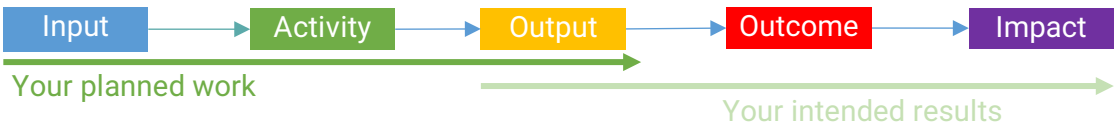

Figure 1 Impact Pathway scheme showing the sequence from research inputs (e.g. finances, material) to research activity and outputs (e.g. publications), which are within the time frame of a usual research project, to the wider outcomes (uptake and application of research output, usually by others) and eventual societal impact. Adapted from CSIRO (2020) and Fryirs et al. (2019).

The tracing of societal impacts can happen through the review of research that is already underway or concluded (in an *ex post* approach; see Barret et al. 2018). It provides a means to tell an impact narrative and develop an account of research impact, for example in reporting about a project, or can serve for learning and analysis, e.g. by assessing enablers of and barriers to research impact.

The workshops will enhance the participants' awareness that, although societal impacts depend on a complexity of contextual factors and their interaction, they usually do not happen merely by chance, and their likelihood can be systematically

enhanced by strategic planning. In planning (and more generally, in assessing) the impact of sustainability-oriented research, two aspects are important: i) what impact should be achieved?, and ii) how is this impact achieved?

Addressing the first aspect entails a formulation of goals, an impact assessment based on impact pathways (via backtracking from impacts), and the definition of criteria and indicators for impact. The second aspect requires an understanding of the barriers and enablers of impacts, as well as (to the extent possible) the definition of criteria and indicators tracing the processes leading to impact.

The workshops build upon each other and broadly comprise three steps: i) joint development of a shared vision and impact hypothesis (focus on *what* impact the research may achieve; workshops 1 and 2), ii) enablers and barriers to impact (focus on *how* impact is achieved and what are potential enablers and barriers; workshop 3), and iii) final strategy (synthesis of previous workshops, finalizing the design of the impact pathway, development of intervention strategy, outlook; workshop 4).

Format of the workshops

This workshop series consists of four half-day workshops, the first two of which are closely related and could be combined into a full day (particularly if workshops are held in person), or planned on subsequent days. The workshops can be conducted either on site or entirely virtually. In both cases, we found the use of virtual whiteboards very helpful (e.g., using Mural or Miro), particularly for documentation and archiving purposes, but the material can also be developed in paper format. Whiteboard templates for each day are provided in the Annex.

> *Suggestion to moderators*: When using digital tools, it is important that all participants have a good knowledge and adequate skills regarding their usage. Plan sufficient time and some exercises at the beginning of the workshop to familiarize participants with the used tools, and/or consider sharing a tutorial for their use prior to the workshop.

Each workshop should be moderated by at least one person, although a team of two moderators works best as one can focus on administration and note taking, while the other leads the participants. Ideally, the entire workshop series is moderated by the same person or team. The number of participants is flexible and can range from three to more than a dozen, but we found that groups of 4-6 participants are an ideal size. The participants can include researchers and non-academic stakeholders such as local project partners from government or community groups, and should be comprised according to the specifics of the research to be assessed (e.g., representing different disciplines, work packages or partners). Each workshop should start with a short presentation prepared by the moderators, drawing on the material in this guide, before going into facilitated group work on whiteboards, and end with a short wrap-up to address remaining questions and an outlook to the content of the following workshop.

Suggestion to moderators: Asking participants regarding their expectations for the workshop series at the beginning can be useful to fine-tune emphasis or inclusion/exclusion of certain material. Short exit surveys of participants between workshops help to adjust the format, schedule and approach by identifying e.g. level of understanding of participants, clarification needs or potential technical challenges, and are particularly recommended if the workshop series is to be repeated more than once.

In the following, the concept of each workshop is described. Suggested schedules as well as templates for each workshop are provided in the Annex. A list of further reading and resources is given at the end of the guide.

Workshop Preparation

Utilize Virtual Workshop Tools: Leveraging virtual whiteboard platforms such as Mural or Miro enhances workshop collaboration and documentation. Design these whiteboards thoughtfully, allowing only necessary items to be editable by participants to maintain structure. Facilitators should share their screen while encouraging individual input to keep participants engaged and informed about the current task. Encourage direct input from participants, but provide support by adding items for them when necessary.

Moderation Techniques: Facilitators should select appropriate moderation techniques tailored to each workshop session. These encompass strategies for actively involving participants, navigating group dynamics, and cultivating constructive discussions, whether in-person or virtual. Additional resources on moderation techniques can be found here:

- In German:
  - Nachhaltigere Innovation durch Beteiligung: Eine Toolbox. https://www.partizipativ-innovativ.de/
  - Organisationshandbuch des Bundesverwaltungsamts. https://www.orghandbuch.de/Webs/OHB/DE/OrganisationshandbuchNEU/4_MethodenUndTechniken/Methoden_A_bis_Z/Workshop/Workshop_node.html
- In English:
  - IUCN SSC CPSG (2020) A Guide to Facilitating Virtual Workshops. http://www.cbsg.org/sites/cbsg.org/files/documents/CPSG%20Virtual%20Workshop%20Guide_Mar30_0.pdf
  - https://www.sessionlab.com/blog/virtual-facilitation/

Workshop Preparation

Participant Diversity: Ensuring diverse representation from various disciplines, sectors, and stakeholder groups is essential for the success of the workshops. Therefore, moderators should send appointment queries and select dates for the workshop that accommodate the availability of a wide range of participants. During the sessions, moderators should foster inclusive discussions and leverage the diverse expertise of participants. This can be accomplished by employing moderation techniques, including group work and facilitated discussions aimed at encouraging quieter participants to share their perspectives and ideas. In cases where language barriers exist, moderators may need to allocate additional time to facilitate translation between languages.

Presentation Preparation: Moderators should prepare concise presentations to facilitate each workshop session. The presentation should encompass a review of previous workshop material, an overview of the current session's objectives, the introduction of relevant concepts, definitions, and/or tools, and active guidance and engagement of participants throughout the workshop.

Wrap-up and Outlook: To effectively wrap up each workshop session and set the stage for the following session the moderators should summarize key insights, address remaining questions, and provide a clear outlook on the agenda for the next session in the end of each workshop. Additionally, moderators may share an **exit survey** (via weblink or paper) to gather individual feedback on several aspects:

(1) What participants liked about the workshop and found interesting or useful.
(2) What participants are taking away from or learned during the workshop.
(3) Any ideas or open questions that remain for future workshops.
(4) Any aspects of the workshop that participants disliked or suggestions for improvement.

Criteria and Indicators used in the workshops

In our workshops, we use criteria and indicators to anticipate: (1) the societal impacts that research contributes to and (2) the processes that create these effects. These indicators come from established systems, making it easier to compare assessments and use available data for possible monitoring. We've made sure these indicators cover all aspects of sustainability and impact generation, and include a mission-orientation, following a systemic approach (Pfeifer & Helming 2024).

To anticipate **(1) the societal impacts that research contributes to**, we organize research impact indicators into three levels:

- contextual impacts - impacts specific to the context,
- societal impacts - side effects on social, environmental, and economic aspects
- transformation impact - contributions to Sustainable Development Goals (SDGs) and their sub-targets

The **context-specific indicators** are gathered from those used for assessing ecosystem services (CICES 2018; WRI 2015). For research dealing with natural resource management, they help foresee how the research contributes to societal goals by influencing changes in ecosystem services. Since our case examples refer more specifically to natural resource management through agri-/aquaculture and fisheries, **social, environmental, and economic side effects** are explained through *SAFA indicators* (FAO 2013), which help anticipate the research's impact on sustainability, including potential synergies and trade-offs. For other contexts, other, better-adapted indicator systems should be used, e.g. Montreal Process Criteria and Indicators (forest management) or GRI Standards (mineral and energy management). Lastly, **contributions to SDGs and sub-targets** are predicted using criteria and indicators from the *Global indicator framework for the Sustainable Development Goals and targets of the 2030 Agenda for Sustainable Development* (UN 2021).

To anticipate **(2) the processes that create these effects,** criteria for impact-generating processes are drawn from the LeNa reflection framework (Ferretti et al. 2016) and by Walsh et al. (2019). The LeNa project has established eight criteria to evaluate research activities concerning their alignment with societal goals and values (Daedlow et al. 2016). These criteria can help in assessing how research endeavors contribute to societal impact by considering relevant societal goals. While a definitive list of criteria is challenging, Walsh et al. (2019) provide a useful framework. Criteria linked to actors involved in the project, influencing their capacity to drive change, include relationships, capacities, organizational structures, and contextual elements. Additional criteria beyond actors can encompass various aspects such as the involvement of diverse actors, the quality and accessibility of evidence, decision-making processes, and collaborative efforts like co-designing and shared visioning.

Workshop 1

Goal:

The first workshop focuses on jointly defining the problem addressed, scope and shared language of the research project/program. Further, the desired changes are mapped. The workshop is concluded with a stakeholder analysis in preparation of the following workshops and to identify stakeholders to verify the mapped impacts.

Preparation:

(Only if on site): Prepare room, beamer, whiteboards, writing utensils, snacks and drinks

(Only if virtual): Set up a video conference link and share with participants

Prepare introductory presentation, set up (virtual) whiteboards, prepare list of links to any online material, share preparatory reading materials with the participants (e.g., template for stakeholder analysis, if used – see resources in Annex).

> *Suggestion to moderators*: In preparation for the workshop, if you are not familiar with it, try to obtain a good overview of the background of the project or program addressed. In particular, familiarize yourself with the stated goals and objectives, work plan, and stakeholders. Does a specific statement regarding expected societal outcomes and impacts exist already?

Content:

The workshop series should start with a short introduction and background, covering the schedule of the day and an outlook on the entire workshop series, the moderators and participants, the format of the workshops (including technological tools used), and the underlying concepts. In introducing the prepared whiteboards, make sure to explain the different elements and how they are to be used, e.g. the meaning of colors. Including screenshots or pictures of the whiteboards in the presentation is helpful.

The ***Theoretical Introduction*** should briefly cover the concept of (societal) research impact and its relevance for your project or institution, what an impact pathway and an impact narrative is, assessment timing, qualitative impact assessment, and the concepts of impact contribution versus attribution (see *Theoretical Background* box in Introduction).

In jointly developing a ***Future Vision***, ask the participants what is the targeted future they wish to contribute to with their research, and to what ideal vision their research will have contributed to in 10-15 years. There may be multiple goals and visions, both for the project and wider context, and for the individual participants. These should be explored. Particularly for projects in the early/development phase, the

"joint visioning" and discussion among partners can be useful to come to terms among the partners. Discussed and agreed items should be noted down in writing. Ultimately, a description in text form should be developed and agreed upon that best captures the goal(s) or the project/program and the views of the participants (Fig. 2).

Figure 2 Example Future Vision

The ***Problem Tree*** exercise aims to identify the central problem the project/program is addressing (see Blundo Canto et al. 2020). Try to agree on a single overarching problem, if at all possible. However, if necessary, two or three parallel central problems may be identified. In a hierarchical manner, the central problem is next broken down into its underlying causes by asking why the problem persists. Causes may themselves be broken down further into underlying causes, but the hierarchy should be limited to 2-3 levels to remain workable; see Figure 3.

To gain a better overview of the project/program context, participants are asked to identify and describe the main ***Partners***. This should cover all participants present, but could be extended to important additional partners involved in the project/program as needed. Ask participants to identify what is the disciplinary background of partners, and what competencies, methods, skills, resources, relationships or authority they can contribute to solve the problem(s) identified before. In case the workshops address research programs or programmatic areas rather than specific projects, it may not be possible to identify concrete partners. Alternatively, partners identified as necessary or potential partners by the participants could be described, or relevant disciplines and expertise listed instead of partners.

Based on the problem setting and the attributes of the project partners, participants are asked to identify what is the feasible ***Scope*** of the project, in terms of dimensions such as spatial, contextual and temporal.

As research projects or programs may be highly multi-, inter- or even transdisciplinary, it can be very helpful to establish a ***Shared Language***. Ask participants for the main keywords, concepts, and methods relevant for their research, and try to find a shared definition for each.

Building upon the developed problem tree, participants are asked what are the ***Desired Changes*** that need to occur to achieve the identified future vision. Changes should be ordered along a timeline, leading up to the future vision. Participants are asked to identify actors associated with particular changes, if possible. Once the diagram depicting desired changes is complete, participants should identify which of the desired changes are within the scope of their project/program. These should be visually marked on the whiteboard, e.g. by outlining them with a thick border, and will be considered subsequently in the workshop series (Fig. 3).

Suggestion to moderators: Desired changes should address the identified underlying causes contributing to the central problem in the problem tree. A good way to begin this exercise is to rephrase the identified causes into their potential solution, e.g. "Existing data on the issue is unavailable to managers" becomes "Existing data to address the issue is made available to managers". However, additional changes beyond those resulting from the problem tree may be necessary to achieve the future vision, which needs to be discussed with the participants.

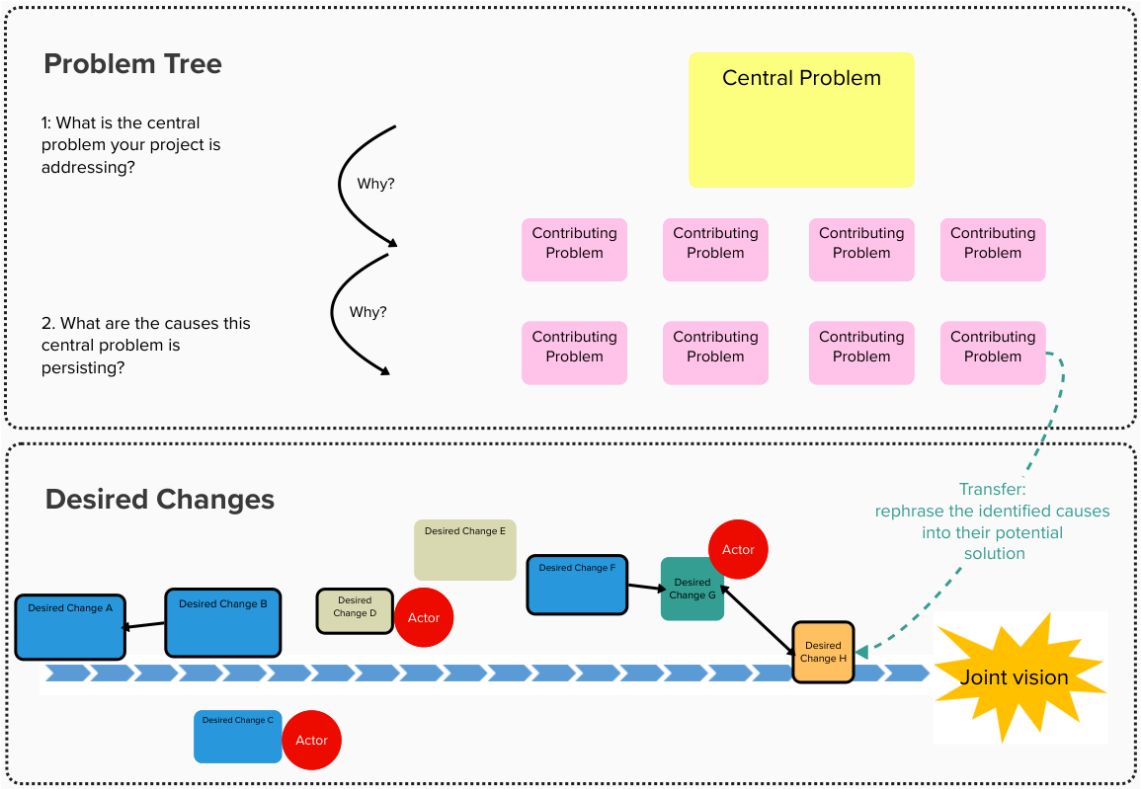

Figure 3 Problem Tree and Desired Changes Exercise (linked elements)

To prepare for the development of the implementation strategy and to strategically plan for societal impact, a ***Stakeholder Analysis*** for the project/program aims to identify actors who are *interested* in the research, who have *influence* in the relevant field(s) of research, and who are *impacted* by the research. For each actor (or type of actor), the relevant desired changes can be listed, as interest, influence and impact may differ depending on the particular change considered. Various templates and guidelines for stakeholder analysis exist; for this exercise, we found the use of the 3i's advanced stakeholder analysis by Mark Reed (2019; see Annex) particularly helpful.

Suggestion to moderators: The order of content above and the time schedule provided in the Annex are based on our experiences in running the workshops, but should be seen as suggestions only. You may adjust the order of elements and the time allocated to each element if needed, or even leave out particular elements, depending on your individual project/program context and schedule.

Workshop 2

Goal:

The second workshop looks at the various potential impacts of the project/program, identifying the most relevant impact criteria and categories and discussing potential indicators. At the end of the workshop (or subsequent to it), an initial draft of the impact pathway is developed.

Preparation:

(Only if on site): Prepare room, beamer, whiteboards, writing utensils, snacks and drinks

(Only if virtual): Set up a video conference link and share with participants

Prepare presentation, set up (virtual) whiteboards, prepare list of links to any online material, share preparatory reading materials with the participants (e.g., the used indicator/criteria sets – see resources in Annex). Prepare whiteboards with impact dimensions and criteria/indicators, using relevant indicator/criteria sets (see below). Criteria should be covered initially and only uncovered by participants if the respective dimension is identified as impacted by the participants.

Suggestion to moderators: To enable a better flow of this exercise, prepare relevant criteria and indicator sets beforehand, and share them with the participants. In case time is limited and the exercises cannot be completed during the workshop, participants can also be asked to continue identifying and sorting impacts afterwards, particularly if virtual whiteboards are used. This is most effective if participants are specifically assigned to work on individual impacts/criteria. However, be mindful that discussion of impacts among the participants is valuable and will often lead to different results than if participants identify and assess potential impacts individually.

Content:

Impacts can materialize on and affect different levels and dimensions. The types of potential impacts and suitable examples and indicators can be adjusted according to the context and specifics of your project/program. In the frame of the LeNa project, we considered three levels of impact. To identify and define these, existing criteria and indicator sets were used. *Context-specific goals* were considered to be societally-defined goals or objectives of relevance in the particular context of the project/program, such as those related to biodiversity, climate change, resource management, risk or cultural value. For this level, criteria and indicators developed by CICES (2018) (for ecosystem services) and WRI (2015) were used (see Annex). *Societal impacts* were considered in terms of impacts on the four dimensions of sustainability (social, environmental, economic and governance). Criteria and indicators for impacts on these dimensions can draw on the SAFA indicator sets (FAO 2013). Lastly, impacts with regards to supporting a wider *sustainability*

transformation were defined by drawing on the UN Sustainable Development Goals and their related targets (UN 2021).

For ***Context-Specific Goals***, ask the participants to identify which of the listed ecosystem services dimensions are impacted by the project/program, then ask them to open the dimensions that are expected to be impacted. Remind them that this consideration should also include unintended impacts. Discuss what kind of impacts the participants expect in the uncovered criteria (direct and indirect positive impact, no impact, direct and indirect negative impact, or unknown/more information needed). Ask participants to make notes of what changes they expect, referring to the provided indicators. Once all expected impacts are identified, ask participants how these criteria relate to each other, adding connections to indicate positive and negative trade-offs. The identification and discussion of trade-offs is time-consuming and may be skipped if there are time constrains. However, identified trade-offs can be helpful in developing a more detailed impact pathway and to better anticipate unwanted or indirect negative outcomes and impacts.

Repeat the exercise for ***Societal Impacts*** by asking which of the four sustainability dimensions is impacted, followed by categories for each dimension expected to be impacted. Again, ask participants to discuss what kind of impacts they expect in the uncovered categories, and to identify connections between categories.

For impacts supporting wider ***Sustainability Transformations***, repeat the exercise by asking participants which of the 17 SDGs are impacted, opening those that are seen as impacted. Proceed by identifying and discussing how targets for each SDG are impacted. Again, discuss connections between impacted targets to identify potential trade-offs.

At the end of the workshop, work with the participants to develop a first ***Draft Impact Pathway***. Use the elements from the first two days to arrange into a schematic pathway from Inputs and Research Activities to Scientific Output, Outcomes, and Contextual, Societal and Transformation Impacts (see Fig. 4). Try to group elements that belong together, and include links between connected elements.

> *Suggestion to moderators*: The draft impact pathway can also be developed by you after the end of the second workshop, if time is limited. In that case, you should give the participants the chance to review and comment on the draft, for which the use of a virtual whiteboard is helpful.

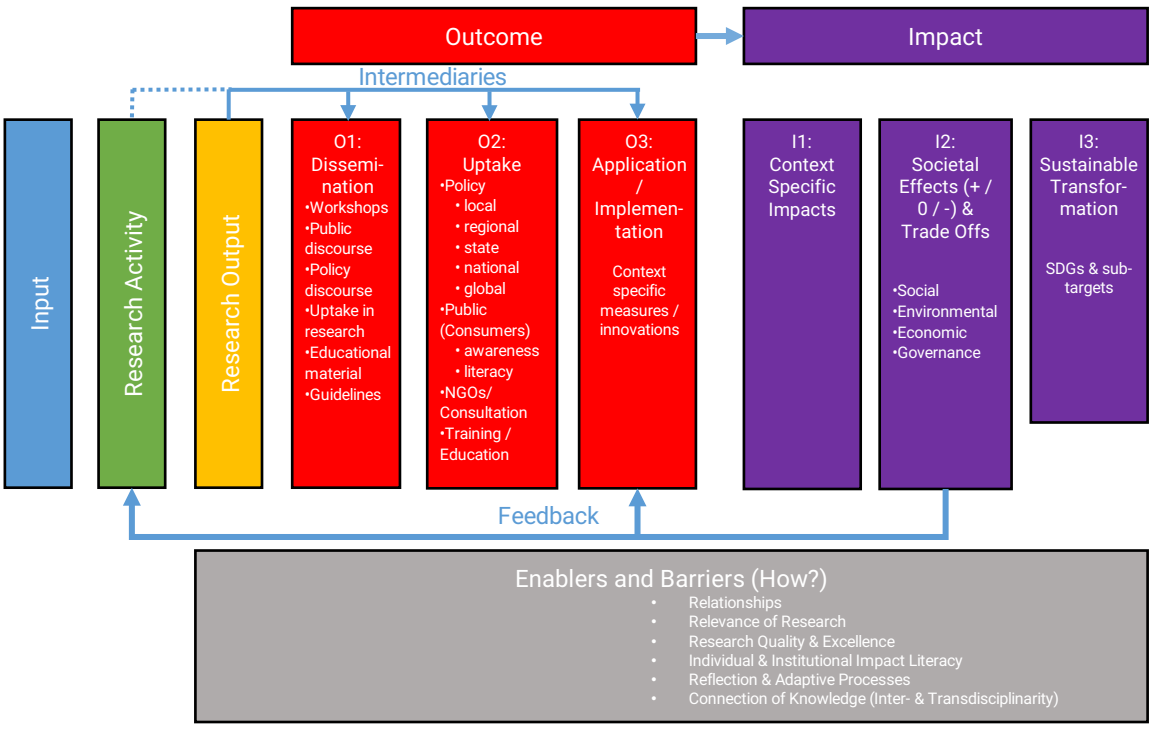

Figure 4 Schematic example of an impact pathway with the different areas addressed in the workshop series. Note that individual items such as specific research activities, outputs or impacts are not yet included.

Workshop 3

Goal:

In the third workshop participants will backtrack the necessary research actions and the relevant barriers and enablers to achieve the desired impacts (defined in workshop 1). The workshop will enable participants to identify important actors and institutions, and to reflect on enabling processes, opportunities/resources and risks for achieving the envisioned impacts.

Preparation:

(Only if on site): Prepare room, beamer, whiteboards, writing utensils, snacks and drinks

(Only if virtual): Set up a video conference link and share with participants

Prepare presentation, set up (virtual) whiteboards, prepare list of links to any online material, share preparatory materials with the participants (e.g., the typology of enablers and barriers developed by Walsh et al. 2019, collection of videos describing the LeNa reflection criteria (LeNa Shape 2023) – see resources in Annex). The Desired Changes diagram developed in the first workshop should be added to the whiteboard as reference regarding the main desired changes within the scope of the project/program, and identified related actors. Prepare a table for actor-related enablers and barriers which contains in the first column the main actors identified in workshop 1 by the participants, and a table of additional enablers and barriers which contains in the first column the main identified desired changes from workshop 1. Example barriers and enablers are provided as movable stickers at the bottom of each table.

Content:

In the ***Introduction*** part, provide a short recap of the previous workshops, looking again at the desired changes diagram, the different impacts section of the draft impact pathway, and the stakeholder table, which constitute the context of the work today. In particular, the desired changes and their related actors will be important. Review the table together with the participants, ask for clarifying questions and provide a short explanation of the diagrams and table, if needed.

Briefly revisit the concept of the impact pathway from workshop 1 and the draft impact pathway from workshop 2 to reiterate the concept of a logical sequence of steps from Research Inputs to Research Impacts. While the first two workshops looked at what impacts the research project/program can achieve, workshop 3 will address how these are achieved, i.e. the processes leading to research impact. Whether or not intended outcomes and impacts are realized depends on contextual factors, and this workshop aims at a better understanding of these factors. To strategically plan for impact, it is useful to look at the impact pathway in terms of a logical framework (or logframe), which represents a simplified causal chain from activity to impact (Fig. 5; see Douthwaite et al. 2007).

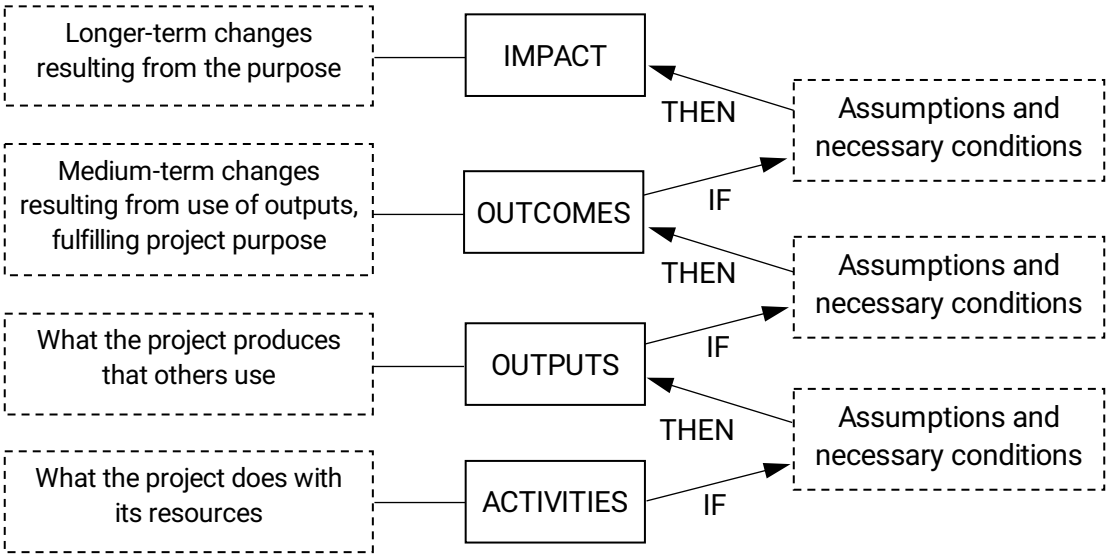

Figure 5 Logical Framework (logframe), representing a simplified causal chain from research activities to impacts. Adapted from Douthwaite et al. (2007).

In the real world, processes are seldom linear, and different factors do not act in isolation but may interact. The logframe thus constitutes a set of assumptions that need to be reassessed and adjusted throughout the project.

In the first exercise, participants are asked to discuss impact-generating processes and ***Factors Supporting Impact*** in their project/program. The LeNa project has identified eight criteria for assessing research activities with regards to their consideration of responsibility towards societal goals and values (Daedlow et al. 2016). As they assist in considering societal goals, these *LeNa Criteria* increase the likelihood of research activities contributing to societal impact. They can thus provide the basis for a discussion among participants of their own research activities and an entry point for reflection on impact-generating processes.

Additional examples of factors supporting the achievement of societal impacts exist in the literature and can be provided to participants as examples or for discussion. These include for example awareness and skills (a deliberate, skilled approach to research impact generates the necessary institutional and individual conditions conducive for maximizing research impact and for anticipating and mitigating negative impacts), relationships (good relationships among actors are essential for developing impactful research programs and for capitalizing on research outcomes), adaptive processes (societal demands and conditions surrounding research in society are complex and constantly changing, requiring processes that monitor whether research still matches stated goals and to allow adjustments if needed), the connection of knowledge (inter- and transdisciplinarity and co-design enhance fit for purpose, responsiveness to needs, and integration of essential expertise and skills), quality and excellence (research is more likely to be taken up by societal stakeholders if it is perceived to be of high quality, trustworthy and reliable; mechanisms to define and monitor quality contribute to demonstrating

quality) and relevance/user orientation (research is more likely to result in societal impact if it is applicable and addresses actual societal needs); see Fig. 6.

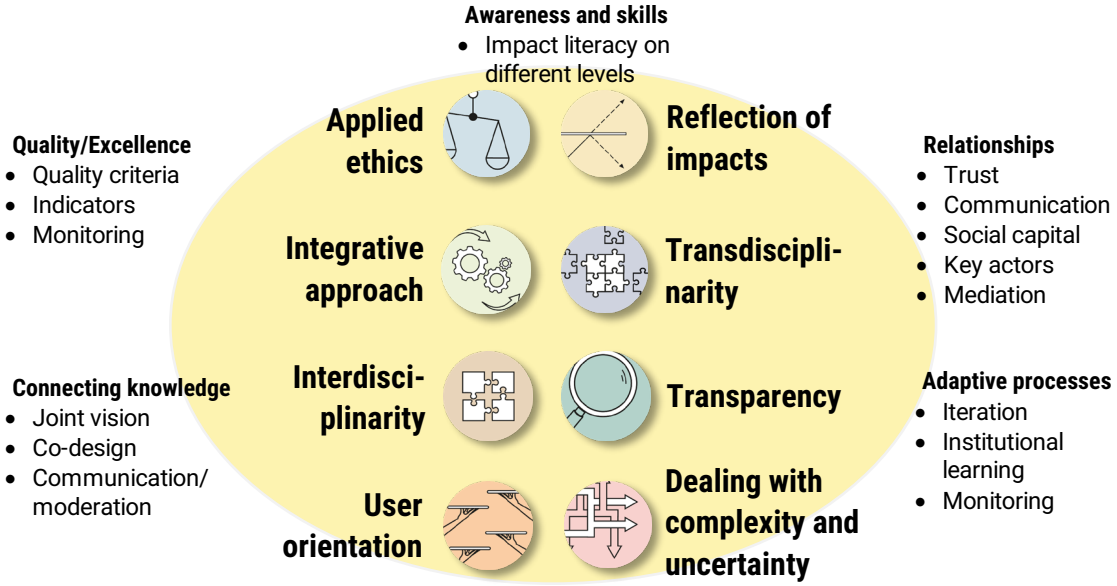

Figure 6 The eight LeNa reflection criteria (center) and additional factors supporting the contribution of research to societal impacts.

For the exercise, participants are first asked to rate the perceived relevance of the LeNa Criteria with regards to achieving societal impact, and to describe how they would lead to or support impact in the context of their project/program. Subsequently, participants are asked to add additional factors they can think of, and to rate and describe them.

Factors related to the achievement of impacts can be thought of in terms of enablers (factors that can assist) and barriers (factors that need to be removed/mitigated in order to achieve impact). The subsequent exercises thus look more closely at enablers and barriers. While there is a rich literature on different factors supporting impact in different contexts and providing a universally valid list of factors is difficult if not impossible, a useful terminology of enablers and barriers has been developed by Walsh et al. (2019). These can be provided as examples to the participants, although they may not all be relevant in the specific context of their project/program, and should only serve as basis for further discussion.

Many of the desired changes necessary to achieve the identified vision of the project are related to specific actors, who by their role or activity can facilitate (or hinder) these changes. Actors in turn are affected by specific enablers and barriers that modify their ability to influence these changes (Fig. 7). Categories of such factors affecting actors include relationships (e.g. are these trusted, long-established), capacities and attitudes (e.g., are actors trained, interested), organizational factors

(e.g., management structure, adaptive processes) and context (e.g., priorities, policies).

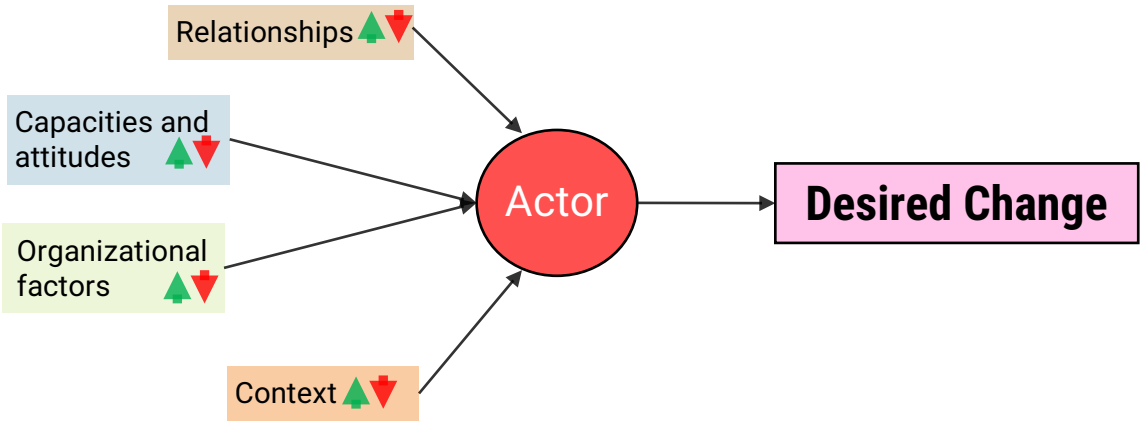

Figure 7 Different categories of factors affecting actors' ability to influence particular, desired changes. Depending on context, factors can either facilitate (enabler, green arrow) or hinder (barrier, red arrow) actors.

To identify ***Enablers and Barriers Related to Actors***, the participants are asked to systematically consider the different actors identified during the first workshop. Examples of potential barriers and enablers related to the key actors previously identified are provided to the participants, who are asked to copy these into the appropriate cells of the table, identify whether the factors are enablers or barriers (as this can change depending on context), and briefly elaborate by adding text. Participants are then asked to add additional enablers and barriers they can think of.

Achievement of particular desired changes can furthermore be facilitated or hindered by additional factors not related to the actors identified as key stakeholders in the context of the project/program (Fig. 8). These include categories of factors such as other actors (e.g., their diversity, potential engagement via transdisciplinarity), the nature of evidence (e.g., its existence, accessibility), the decision context (e.g., existence of participatory processes, monitoring), or other factors (e.g., existence of co-design processes, joint visioning).

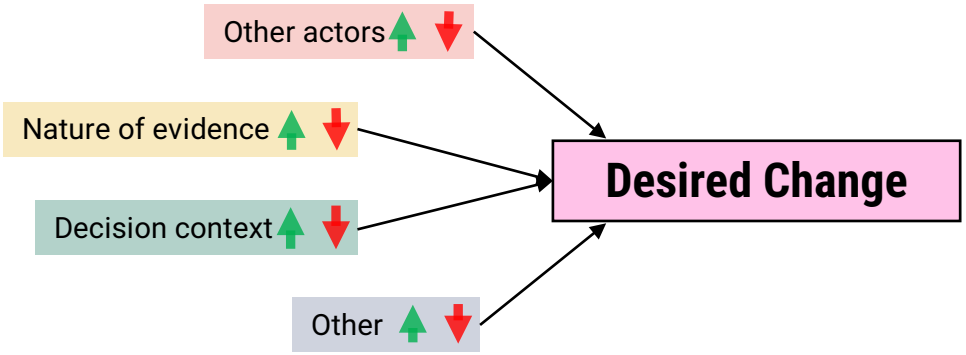

Figure 8 Different categories of factors affecting the achievement of particular, desired changes. Depending on context, factors can either facilitate (enabler, green arrow) or hinder (barrier, red arrow) achievement of changes.

To identify and discuss ***Additional Enablers and Barriers***, the participants are asked to systematically consider the different desired changes identified during the first workshop. Examples of potential barriers and enablers related to the desired changes they have previously identified are provided to the participants. They are again asked to copy these into the appropriate cells of the table, identify whether the factors are enablers or barriers, and briefly elaborate by adding text. Participants are then asked to add additional enablers and barriers they can think of. Next, each participant can distribute points to identify those enablers and barriers they believe are most relevant. The enablers and barriers with the highest points are assessed further in the subsequent task.

Suggestion to moderators: If participants are undecided about whether a factor constitutes an enabler or a barrier, e.g. because they deem this to differ according to context even within the project, they may use a different color to identify unclear/undecided factors, but should add a short explanation/description.

Focusing on a few of the enablers and barriers for the subsequent task is recommended for time reasons. Prepare a number of sticky/movable red and green points per participant for voting. Alternatively, you may also select specific enablers and barriers to focus on yourself, e.g. those that seem to be most central or that reoccur in different variations. Participants should be encouraged to revisit the whiteboard afterwards and assess any additional enablers and barriers not yet assessed which they might be interested in.

The subsequent exercise addresses ***Opportunities and Risks*** related to the enablers and barriers identified before. To support or activate enablers, and mitigate or overcome barriers, there may be resources already existing within (or accessible to) the project/program, such as databases, training, funds/funding opportunities, or links to organizations or institutions. On the other hand, there may be specific risks that hinder enablers from functioning, or which prevent the overcoming of barriers,

such as data becoming inaccessible, connections among actors becoming compromised, or key personnel leaving an institution (Fig. 9).

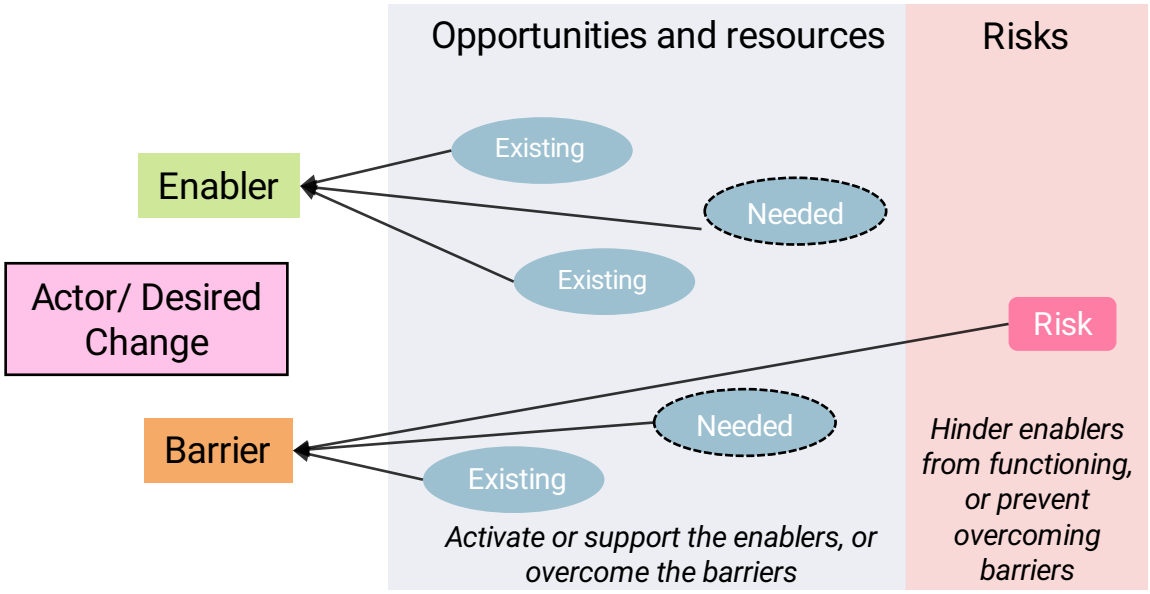

Figure 9 Opportunities, resources and risks related to enablers and barriers.

The prioritized enablers and barriers from the previous task are entered into the first column of the table prepared for assessing opportunities and risk, and the actors or desired changes they refer to are listed in the second column. For each of the listed enablers and barriers, participants are asked to think of opportunities and resources to activate or support the enablers, or to overcome the barriers. These should be differentiated into already existing ones and those still needed (if possible, together with potential sources, as this supports project planning). Next, participants are asked to identify and describe potential risks related to the enablers and barriers.

Suggestion to moderators: If certain factors are deemed to constitute an enabler for some actors/changes, but a barrier for others, or if opportunities, resources and risks differ depending on which actor/change is considered, you may use multiple rows for the same factor, listing them as enabler in one and barrier in another row, or relating them to different actors/changes in different rows.

The final task of the workshop is the development of a ***Risk Mitigation Strategy*** that addresses the risk identified in the previous task. These are entered into the first column of the table for this exercise. For each of the listed risks, participants are asked to estimate how likely they are to occur over the course of the project/program (likelihood), and what the magnitude of its effects on the successful reaching of project/program goals would be (severity). Then, they are

asked to outline how this risk could be mitigated, who would best be responsible for mitigating the risk, and at what time in the project/program mitigation of the risk needs to be carried out (e.g. more at the beginning, continuously throughout, or towards the end of the project/program). While this exercise works best when addressing specific projects (as details are usually much clearer), it can also successfully be applied to program development, although risks and their mitigation strategy may be described more generically.

Suggestion to moderators: Depending on the timing, you may ask the participants to enter enablers, barriers, related changes and risks in the two final tasks themselves. This allows for exchange and discussion among participants, and to clarify any items that may not be fully agreed upon. Alternatively, you can use breaks to fill in the columns yourself, or (if working in pairs) one moderator fills in terms while the other is describing the exercise. Participants should be encouraged to revisit the whiteboards after the workshop and fill in information for additional enablers, barriers and risks, particularly if not all items could be addressed in the time of the workshop. Even if joint development and discussion during the workshop is preferable, asking participants to fill in additional information afterwards can assist in project/program planning and thus increase the utility of the workshops to participants.

An additional approach to save time is to distribute rows in the tables among the participants, with each of them asked to fill in their respective row on their own and results discussed jointly by the group at the end of the respective task.

Workshop 4

Goal:

In the fourth and final workshop, participants will finalize the impact pathway for the (proposed) research project/program. Further, the participants will outline a detailed intervention strategy and conceptualize how they want to use the developed material (grant proposal, reflection, M&E strategy, communication, reporting).

Preparation:

(Only if on site): Prepare room, beamer, whiteboards, writing utensils, snacks and drinks

(Only if virtual): Set up a video conference link and share with participants

Prepare presentation, set up (virtual) whiteboards, prepare list of links to any online material, share preparatory materials with the participants. Enter information from the previous workshops into the elements on the whiteboard (desired changes from workshop 1 and risks from workshop 3 are provided on sticky notes next to the draft impact pathway; actors and related changes identified during the stakeholder mapping in workshop 1 are entered into the table for the intervention strategy). Review the draft impact pathway, adding information that resulted from the previous workshops, and clean up the impact pathway by sorting elements and removing redundancies.

Suggestion to moderators: If available to you, you can review project/program-related documents (e.g. project proposals, strategic plans) to check whether elements (e.g. deliverables, tasks, objectives) are still missing from the impact pathway, then add them before the workshop and discuss them with participants. Consider incorporating partner institutions and their supportive resources in the "Input" section. You may refer to the tasks outlined in the work packages, as a foundation for the "Research Activity" section, and their planned deliverables for the "Output" section.

Content:

In the ***Introduction*** part, provide a short recap of the previous workshops, revisiting the enablers, barriers and risks and the concept of the impact pathway, and show how the elements of the different workshops will be connected to develop the finalized impact pathway and intervention strategy (Fig. 10).

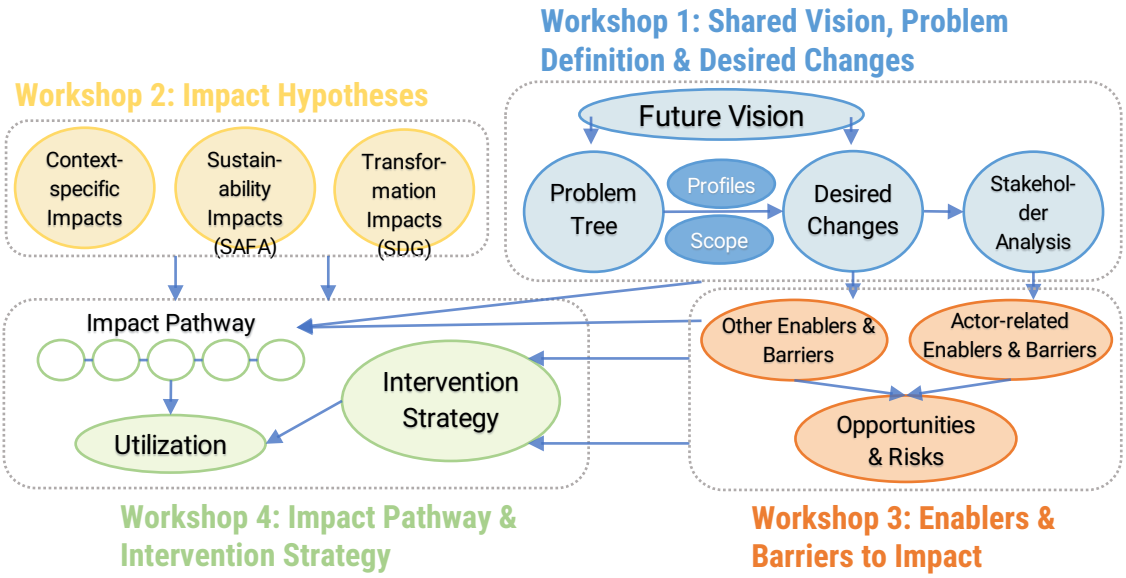

Figure 10 Schematic overview of the different workshops and their elements, showing how they feed into each other.

The first task of the workshop is dedicated to the finalization and ***Visualization of the Impact Pathway*** (Fig. 11). Discuss the components of the draft Impact Pathway with the participants, which should include elements of both the different desired changes identified in workshop 1 and of the different positive and negative impacts identified in workshop 2. What is missing? What is too detailed / not relevant? If there are desired changes previously identified that are not yet added, ask participants to add and locate them on the impact pathway. Come to a consensus which components should be included / excluded and make changes accordingly. Next, discuss how the components link to each other. For example, is one component the consequence of another? Are there (additional) interactions between components that have not been considered yet? Ask participants to draw these links between elements in the impact pathway, and add numbers to each link for reference. Participants are then asked how they would describe these links, and what kind of processes are part of the link. They should assign the previously identified actors, enablers and barriers to each link. Discuss whether there are any links that remain poorly described. Lastly, ask the participants where the risks they identified in the previous workshop play a role in the impact pathway, placing the prepared Risk Markers (sticky notes with risks) in the pathway.

Suggestion to moderators: Participants may feel uncomfortable in developing what they might perceive as a definite, final scheme for their project/program. It is important to reiterate that the impact pathway constitutes a snapshot based on currently available and jointly elaborated information, which can and should be adjusted and updated as the project/program develops further.

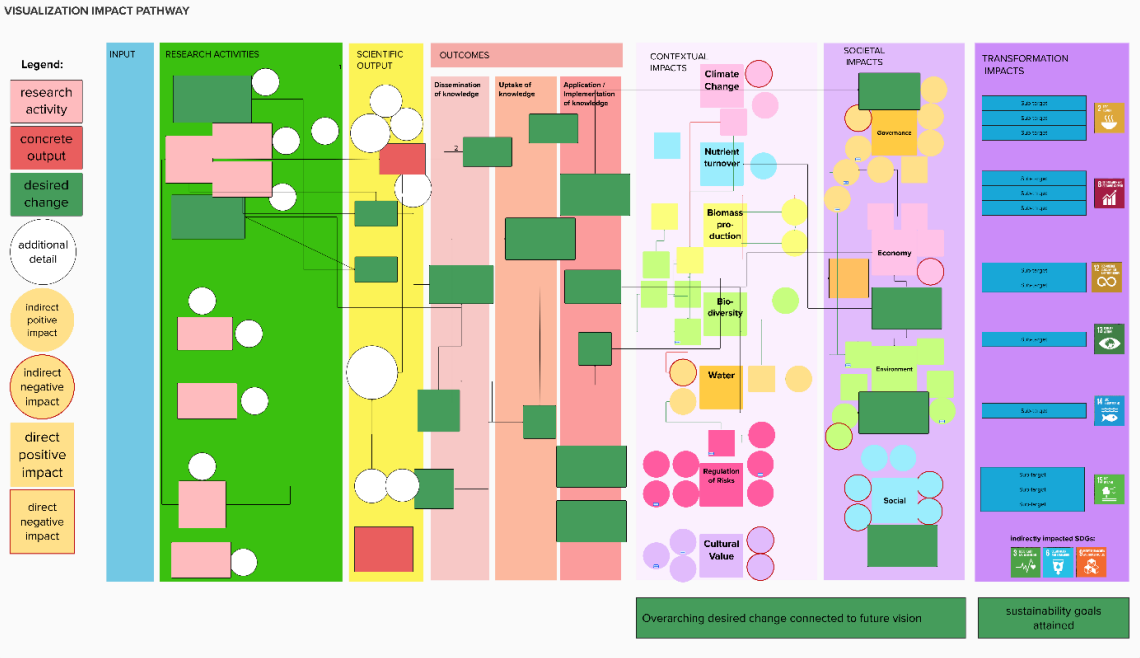

Figure 11 Exemplified final Impact Pathway graphic.

In the second task, participants are asked to develop an ***Intervention Strategy*** for their project/program. Based on a good understanding of the relevant actors, their interests, needs and capacities, an intervention strategy can be developed to strategically support the achievement of desired impacts. An intervention strategy is a structured approach to contribute to achieving the desired vision. It entails looking at the identified actors and desired changes, and asking who would (need to) do what differently, and why. Changes include e.g. (direct) changes in practice, behaviors and interactions, as well as underlying changes in skills, knowledge, motivation and attitude of actors to achieve the previously identified desired changes. Different tools and structured approaches to support achievement of changes and impact planning exist, for example Outcome Mapping (Earl et al. 2001; see also Douthwaite n.d., Tilley et al. 2018, Blundo Canto et al. 2020, Reed 2021), which may be used for the development and further refinement of an intervention strategy.

Participants are asked to review the pre-listed desired changes in practice required to achieve the future vision, considering the impact pathway. Are any required, desired changes missing? Ask participants to identify the actors that are required to change/behave in a similar way to achieve a particular change, listing them in the subsequent column. Use additional rows for actors required to change in a different way related to the same change in practice. Ask participants to describe the required changes in actors' knowledge, motivation, attitude and skills that are required to bring about the change in practice. Discuss what knowledge is needed for actors to change their practices, what individual or collective capacities they need to be able to appropriate the intervention outputs, and whether the actors who are supposed to change are motivated to do so. In a third step, discuss what are the

project/program outputs and strategies to achieve the desired changes. Ask participants to describe the types of outputs or strategies and their main objective, to list the resources required (e.g. personnel, funds), and to describe the timing (e.g. continuous, towards the end of the project). Lastly, for each desired change, discuss whether there are any other things to consider. Ask participants to list for example particular, relevant enablers, barriers or risks, and describe how to address them.

The final block of the workshop is dedicated to the joint discussion of the **Utilization of Workshop Material**. The workshop material, which includes tables, diagrams, and provided resources, can be utilized for example in (see Fig. 12):

- The RIA workshop material may be used for the **development or revision of project proposals.** Initially, there's project planning, which encompasses both new projects and those seeking follow-up funding. During this phase, it's crucial to systematically identify research problems and goals while ensuring clarity and consensus among team members. Identifying relevant research partners, collaborators, and stakeholders is another vital aspect of this process. Once the project is planned, attention shifts to the research grant application. Here, it's essential to include elements such as Impact Pathway graphics or Impact Narratives/Theory of Change statements. Some funders, like those associated with the EU framework program, may require detailed impact statements or the development of elaborate impact strategies. Furthermore, the workshop material also add value to existing projects. This involves revisiting project goals and strategies to incorporate new insights or approaches, thereby enhancing the project's overall impact and effectiveness.

- **Regular reflection loops**, as exemplified by the ImpresS approach by CIRAD (Blundo Canto et al. 2020), involve strategic planning and adaptation of ongoing projects or programs. Regular reflection activities may include assessing the project plan, incorporating new developments, adjusting goals in response to changes in the system, and monitoring the progress of the project or program. Determining the timing, scope, and responsibilities for reflection is essential for effective implementation.

- **Monitoring and evaluation** strategies, such as those outlined in the ImpresS approach by CIRAD (Blundo Canto et al. 2020) or the PIPA approach by Douthwaite (n.d; 2007), focus on assessing project progress and outcomes. Classical monitoring and evaluation methods typically concentrate on individual components and adopt a top-down approach. In contrast, outcome-oriented monitoring and evaluation, often characterized by participatory approaches, examine both individual components and causal links, employing a bottom-up perspective. Participatory methods may involve stakeholders in the evaluation process, fostering a collaborative approach to project assessment.

- *Impact Pathway* graphics, *Impact Narratives*, or *Impact Statements* may be used for **communication and reporting** activities. These materials can provide a clear overview of project goals, activities, and outcomes (required for some funding; examples include UK REF and EU framework program).

They may also serve as valuable tools for science communication, facilitating the dissemination of project findings to relevant audiences and stakeholders through websites or other platforms (see e.g. USDA-NIFA (n.d.), ZALF (n.d.)).

- The **empirical information** generated, for example, in the indicator exercises or Stakeholder Analysis, can be further utilized within the project.

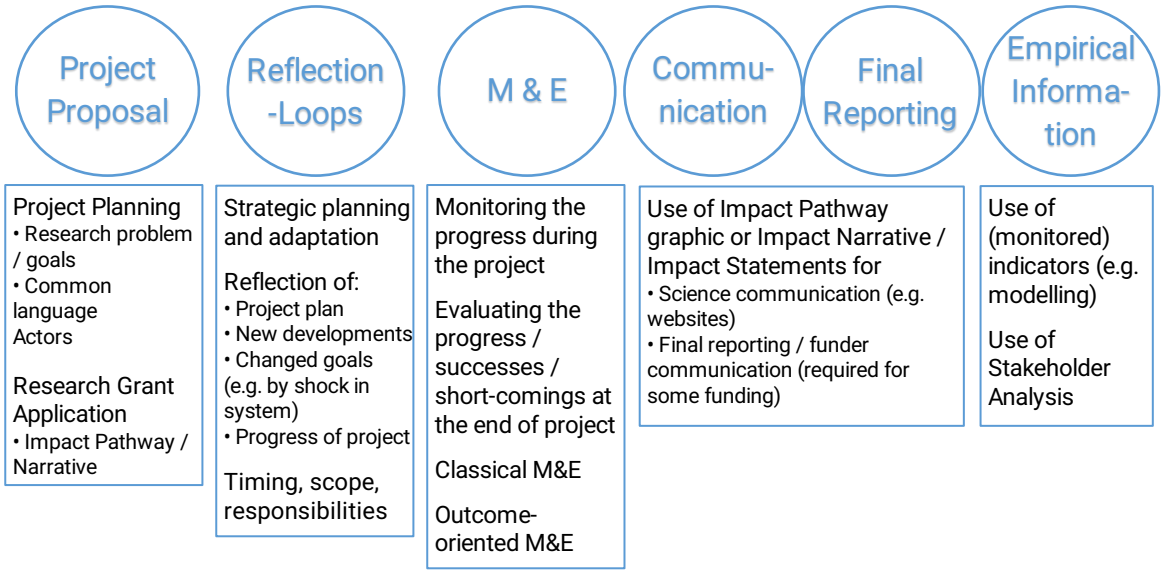

Figure 12 Examples of different kinds of uses of workshop material.

Discuss with participants the different options to utilize the workshop material in their project/program, asking what seems relevant to them, when they aim to implement these options, and who is responsible for preparing / conducting these options. Participants should brainstorm relevant utilization options, considering timing and responsibilities.

End the workshop with a ***Wrap-Up and Outlook***, giving the participants the chance to clarify any remaining questions they may have and informing them of what you will provide to them after the workshop.

Suggestion to moderators: Depending on your role in the institution and association with the project/program addressed in the workshops, you may want to remain in regular contact with (some of) the workshop participants, e.g. assisting them in the implementation of their impact strategy or in regular reflection loops regarding their planned impacts. You may also offer to finalize the draft impact pathway and provide it to the participants, share the workshop procedure/schedule and resources with them (e.g. in a dedicated cloud folder), and/or provide copies of the whiteboards. If you have used digital whiteboards, we recommend you to archive copies of the versions worked on by participants for future reference, and make an editable version available to the participants for their own future use in the project/program.

Further reading and resources

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Annex

Proposed time plan and schedule

Workshop 1: Shared Vision, Desired Changes and Stakeholder Mapping (4 h)

	Item	Duration	Task
1.	Introduction	20min	

2.	Problem Setting, Scope and Language	100 min	- **Future Vision**: What is the targeted future you wish to contribute to with your research? In 10-15 years, to what ideal vision will your research have contributed?
			- **Problem Tree:**
			  - What is the central problem your project is addressing?
			  - What are the causes this central problem is persisting?
			- **Partners**: Who are the people involved in the project? What is the disciplinary background? What competencies, methods, skills, resources, relationships or authority do you contribute to solve the problem?
			- **Scope:** Based on the problem setting and the attributes of the project partners: What is the feasible scope of the project?
			- **Shared Language**: What are the main keywords, concepts, methods relevant for your research? Find a shared definition for each.

	Break	10 min	
3.	Mapping of Desired Changes	45 min	- Based on your problem tree, what are the desired changes that need to occur to achieve the future vision? Try to order them along a timeline. If possible, identify actors associated with particular changes using red circles. - Which of the desired changes are in the scope of your project? Mark them with a border.
	Break	10 min	

4.	Stakeholder Analysis	45 min	- 3i's stakeholder mapping adapted from Marc Reed (2019) - Template accessed at 3 i's advanced stakeholder analysis (fasttrackimpact.com) - What types of actors are relevant to achieving the identified desired changes? What is their level of interest in and influence on bringing about the desired changes, and how are they impacted by them? What are other relevant aspects regarding each stakeholder?
5.	Wrap-Up and Outlook	10 min	

Workshop 2: Impact Hypotheses (3.5 h)

1.	Welcome & Introduction	15 min	
2.	Impact Hypothesis Part 1	60 min	- 1 Which of the ecosystem services dimensions are impacted by the project? - 2: Open the dimensions that are expected to be impacted. - 3: What kind of impacts do you expect in the uncovered criteria? Please make notes of what changes you expect (see indicators). - 4: How do these criteria relate to each other? Add connections.
	Break	10 min	
3.	Impact Hypothesis Part 2	45 min	- 1 Which of the sustainability dimensions are impacted by the project? - 2: Open the dimensions that are expected to be impacted. - 3: What kind of impacts do you expect in these dimensions? Please make notes of what changes you expect (see indicators). - 4: How do these criteria relate to each other? Add connections.
	Break	10 min	
4.	Impact Hypothesis Part 3	45 min	- 1 Which of the SDGs are impacted by the project? - 2: Open the SDGs that are expected to be impacted. - 3: What kind of impacts do you expect in the uncovered SDG sub-targets? Please make notes of what changes (see indicators). - 4: How do these sub-targets relate to each other? Add connections.
5.	Impact Pathway first draft	20 min	- Use the elements from the first two days to arrange into a first Impact Pathway from Inputs and Research Activities to Scientific Output, Outcomes, and Contextual, Societal and Transformation Impacts
6.	Wrap-up and Outlook	5 min	

Workshop 3: Enablers and Barriers to Impact (4h)

	Item	Duration	Task
1.	Introduction	20 min	
2.	Factors supporting impact	60 min	- Below the eight "LeNa criteria" for societally-responsible research are listed. Please *i)* rate their relevance with regards to achieving societal impact (from 1=low to 6=high), and *ii)* describe how they would lead to or support impact in the context of your project/program. At the bottom, please add additional factors you can think of.
	Break	15 min	
3.	Enablers and Barriers related to Actors	30 min	- Below, you find examples of potential barriers and enablers related to the **key actors** you have previously identified. Please copy these into the appropriate cells of the table, change the color to either green (enabler) or red (barrier), and briefly elaborate by adding text. Add additional enablers and barriers you can think of. - A detailed inventory of different Enablers and Barriers can be found here: https://tinyurl.com/EnablerInventory
4.	Additional Enablers and Barriers	30 min	- Below, you find examples of potential barriers and enablers related to the **desired changes** you have previously identified. Please copy these into the appropriate cells of the table, change the color to either green (enabler) or red (barrier), and briefly elaborate by adding text. Add additional enablers and barriers you can think of. - A detailed inventory of different Enablers and Barriers can be found here: https://tinyurl.com/EnablerInventory - Each participant can distribute five green points (Enablers) and five red points (Barriers) to identify those enablers and barriers they believe are most relevant. The enablers and barriers with the highest points are assessed further in the subsequent task.
5.	Opportunities and Risks	30 min	- For each of the listed Enablers and Barriers, think of **opportunities and resources** to activate or support the enablers, or to overcome the barriers, and of potential **risks** (factors that hinder the enablers from functioning or that would prevent barriers from being overcome).

	Break	10 min	
6.	Risk Mitigation Strategy	30 min	- For each of the listed Risks, estimate how likely they are to occur over the course of the project (likelihood), and what the magnitude of its effects on the successful reaching of project goals would be (severity). Then, outline how this risk could be mitigated, who would best be responsible to mitigate the risk, and at what time in the project mitigation of the risk needs to be carried out (e.g. more at beginning, continuously throughout, or towards the end of the project).
6.	Wrap-Up and Outlook	15 min	

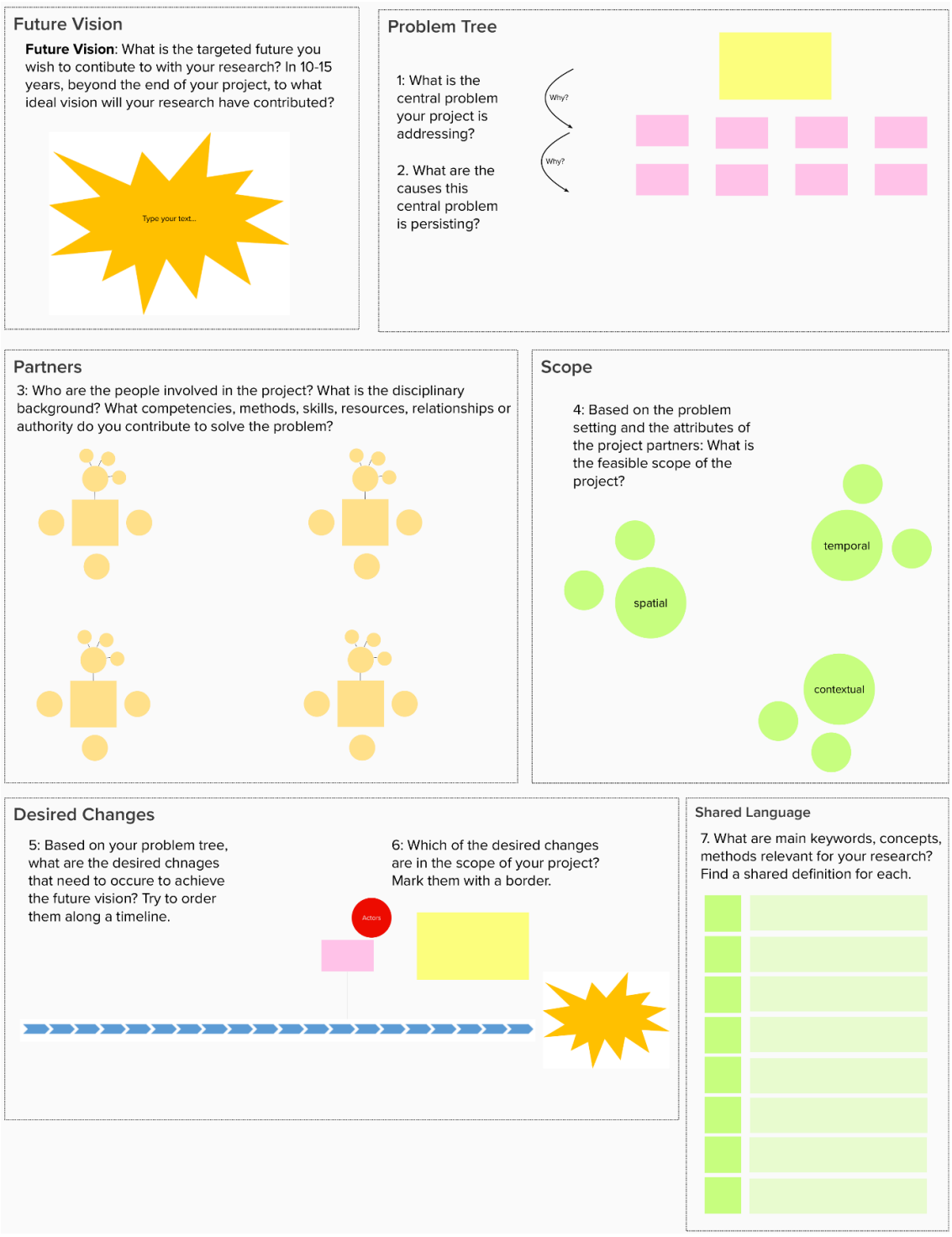
Workshop 4: Impact Pathway and Intervention Strategy (4h)

	Item	Duration	Task
1.	Introduction	20 min	
2.	Visualization of Impact Pathway	80 min	- 1: Discuss the components of the Impact Pathway. What is missing? What is too detailed / not relevant? **> Come to a consensus which components should be included / excluded and make changes accordingly.** - 2: How do these components link to each other? Is one component the consequence of another? Are there (additional) interactions between components? **> Draw these links** - How would you describe these links? What kind of processes are part of the link? **> Annotate and Describe each link; assign the previously identified actors, enablers and barriers to each link - are there any links that remain poorly described?** - 3: Where do your identified risks play a role in the Impact Pathway? **> Place the Risk Markers in the Impact Pathway**.
	Break	10 min	
3.	Intervention Strategy	80 min	- 1: Review the listed desired changes in practice required to achieve the Future Vision, considering the Impact Pathway. **> Are any required, desired changes missing? Which are the actors that are required to change/behave in a similar way to achieve a particular change?** - 2: List the actors that are required to change/behave in a similar way to achieve a particular desired change. **> Use additional rows for actors required to change in a different way related to the same change in practice. Describe the required changes in actors' knowledge, motivation, attitude and skills that are required to bring about the change in practice.** - 3: What are the project outputs and strategies to achieve the desired changes? **> Describe the types of outputs or strategies and their main objective. List the resources required (e.g. personnel, funds), and describe the timing (e.g. continuous, towards the end of the project,...)**.

			Are there any other things to consider? >**For example, list particular, relevant enablers, barriers or risks, and describe how to address them.**
	Break	10 min	
4.	Utilization of Workshop Material	30 min	- Discuss the options to utilize the workshop material in your project? What seems relevant to you? When do you aim to implement these options? Who is responsible for preparing / conducting these options? **> Please brainstorm in your group relevant utilization options**. **Please also consider timing and responsibilities.**
6.	Wrap-Up	10 min	

Examples of whiteboards for the workshops

Workshop 1



Stakeholder Mapping

Desired Changes	Actors	Interest				Influence (indirect)				Impact (direct)			Other
	Name of organization, group or individual	**Scope of interest:** • local, national, international • short-term, mid-term, long-term	**Nature of interest (preferences):** What aspects of the research are they likely to be interested in?	**Nature of interest (values):** What values and beliefs/ assumptions might drive or inhibit this interest or disinterested?	**Level of interest** in the research: • high • medium • low	**Nature of influence:** ability to facilitate or block generation of benefits from the research	**Nature of influence:** • explicit, hierarchical "power over" • implicit, personal or transpersonal "power with"	**Reach of inflence:** who can they influence at what geographical or social scale?	**Level of influence** in the research • high • medium • low	**Nature of impact:** research likely to generate direct benefits or negative impacts for actor	**Timing of impact**: benefits or negative impacts nore short or long-term • short-term • long-term	**Level of impact**: how significant are the identified impact likely to be for the actor? • high • medium • low	e.g. existing relationships with this actor; network they are part of; politcal context they are part of ...

LeNa

Stakeholder Mapping

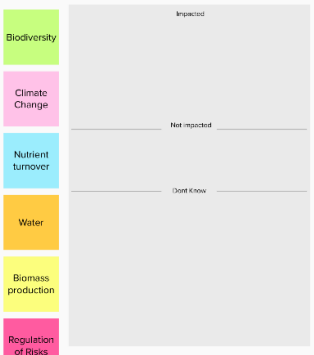
What types of actors are relevant to achieving the identified desired changes? What is their general level of interest in and influence on bringing about the desired changes, and how are they impacted by them? Please indicate from low (+) to high (+++).

Types of Actors Name of organization, group or individual	**Desired Changes**	**Interest**	**Influence**	**Impacted**	**Other** e.g. existing relationships with this actor; network they are part of; political context they are part of ...

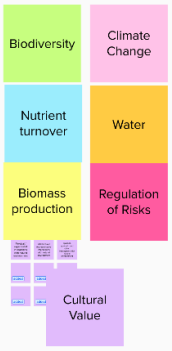
Workshop 2

Impact Hypothesis I

1 Which of the ecosystem services dimesions are impacted by the project?



2: Open the dimensions that are expected to be impacted.



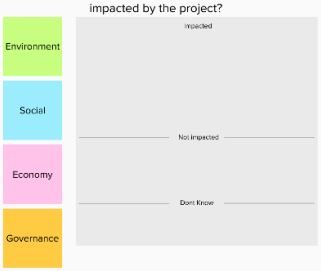
3: What kind of impacts do you expect in the uncovered criteria? Please make notes what changes (see indicators).

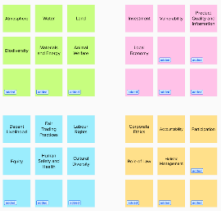
Direct positive impact	
Indirect positive impact	
No impact	
Indirect negative impact	
Direct negative impact	
Dont Know / More knowledge needed	

4: How do these criteria relate to each other? Add connections.

Impact Hypothesis II

1 Which of the sustainability dimensions are impacted by the project?





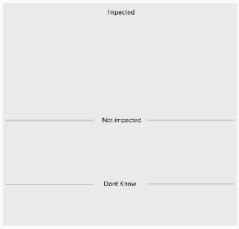
2: What kind of impacts do you expect in these dimensions? Please make notes what changes (see indicators).

Direct positive impact	
Indirect positive impact	
No impact	
Indirect negative impact	
Direct negative impact	
Dont Know / More knowledge needed	

4: How do these criteria relate to each other? Add connections.

Impact Hypothesis III

1 Which of the SDGs are impacted by the project?



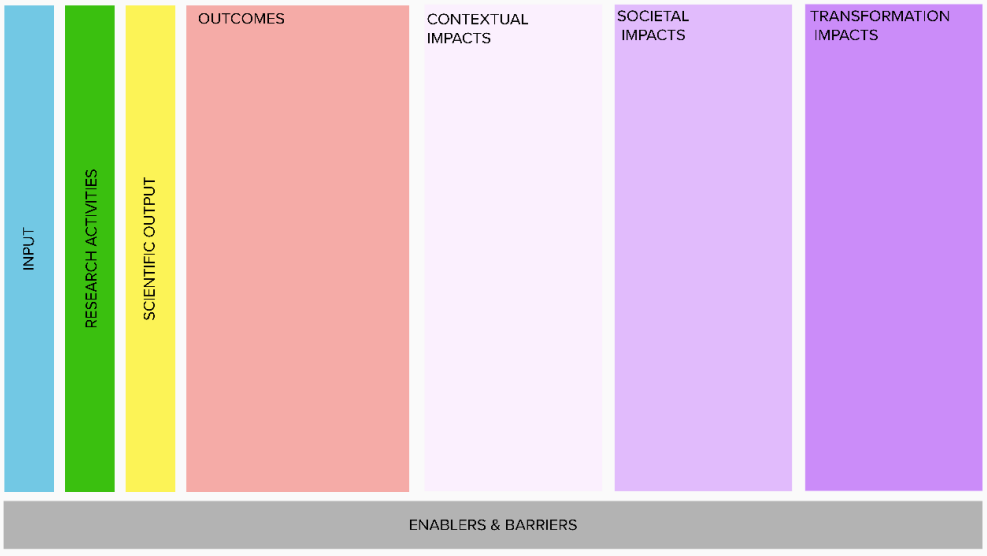
2: Open the SDGs that are expected to be impacted.

3: What kind of impacts do you expect in the uncovered sub-targets? Please make notes what changes (see indicators).

Direct positive impact	
Indirect positive impact	
No impact	
Indirect negative impact	
Direct negative impact	
Dont Know / More knowledge needed	

4: How do these sub-targets relate to each other? Add connections.

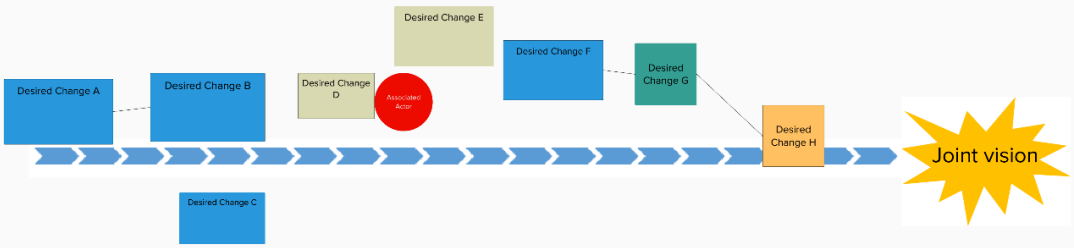
Impact Pathway Fist Draft



Workshop 3

Desired Changes

[copy in the Desired Changes graph from the first workshop]



Factors supporting impact

Below the eight **"LeNa criteria"** for societally-responsible research are listed. Please ***i)*** **rate their relevance** with regards to achieving societal impact (from 1=low to 6=high), *ii)* describe how they would **lead to or support impact** in the context of your project/program.
At the bottom, please add additional factors you can think of.

Criterion	Relevance in achieving impact	How contributing to impact in project/program context?
Ethics		
Transparency		
Interdisciplinarity		
Transdisciplinarity		
Integrative approach		
Dealing with Complexity		
User Orientation		
Consideration of impacts		
... [add]		
... [add]		

Actor-related enablers and barriers

Below, you find examples of potential barriers and enablers related to the **key actors** you have previously identified. Please copy these into the appropriate cells of the table, change the color to either green (enabler) or red (barrier)*, and briefly elaborate by adding text. Add additional enablers and barriers you can think of.

Actors Name of organization, group or individual (Actor Table)	**Relationships**	**Capacities and attitudes**	**Organizational**	**Context**
[Actor 1]				
[Actor 2]				
[Actor 3]				
[Actor 4]				
...				

Duration	Power imbalances	Trustful	Capacity, resources, finance	Skills & Awareness	Management structure	Adaptive processes	Nature of issue	Social context
Conflict resolution	Respectful	Researcher-Practitioner	Values and beliefs	Awareness of literature	Work culture	Decision processes	Political context	Economic context
Diversity	Social capital	Researcher-Policy Maker	Openness to change					

*A detailed inventory of different Enablers and Barriers can be found here:
https://tinyurl.com/EnablerInventory

Additional enablers and barriers

Below, you find examples of potential barriers and enablers related to the **desirable changes** you have previously identified. Please copy these into the appropriate cells of the table, change the color to either green (enabler) or red (barrier), and briefly elaborate by adding text. Add additional enablers and barriers you can think of.

Desired Changes	Nature of evidence	Decision context	Other actors	Other
Desired Change A				
Desired Change B				
Desired Change F				
Desired Change D				
Desired Change H				

Existence
Accessibility
Transformative
Process of knowledge generation and synthesis
Relevance & Applicability
Trusted
Quality
Impartial
Transparency
Inter-disciplinary
Holistic, integrative information

Institutional learning
Complexity and uncertainty
Advice and training
Participatory processes
Public discourse
Adaptive processes
Public awareness
Monitoring

Values and Beliefs
User orientation
Diversity
Ethics and Norms
Trans-disciplinarity

Co-design processes
Values and Beliefs
Joint visioning

Use the dots below to **mark** what you think are the **5 most relevant enablers** (in green) **and barriers** (in red) across tables 1, 2 and 3 above.

*A detailed inventory of different Enablers and Barriers can be found here: https://tinyurl.com/EnablerInventory

Opportunities and Risks

For each of the listed Enablers and Barriers, think of **opportunities and resources** to activate or support the enablers, or to overcome the barriers, and of potential **risks** (factors that hinder the enablers from functioning or that would prevent barriers from being overcome).

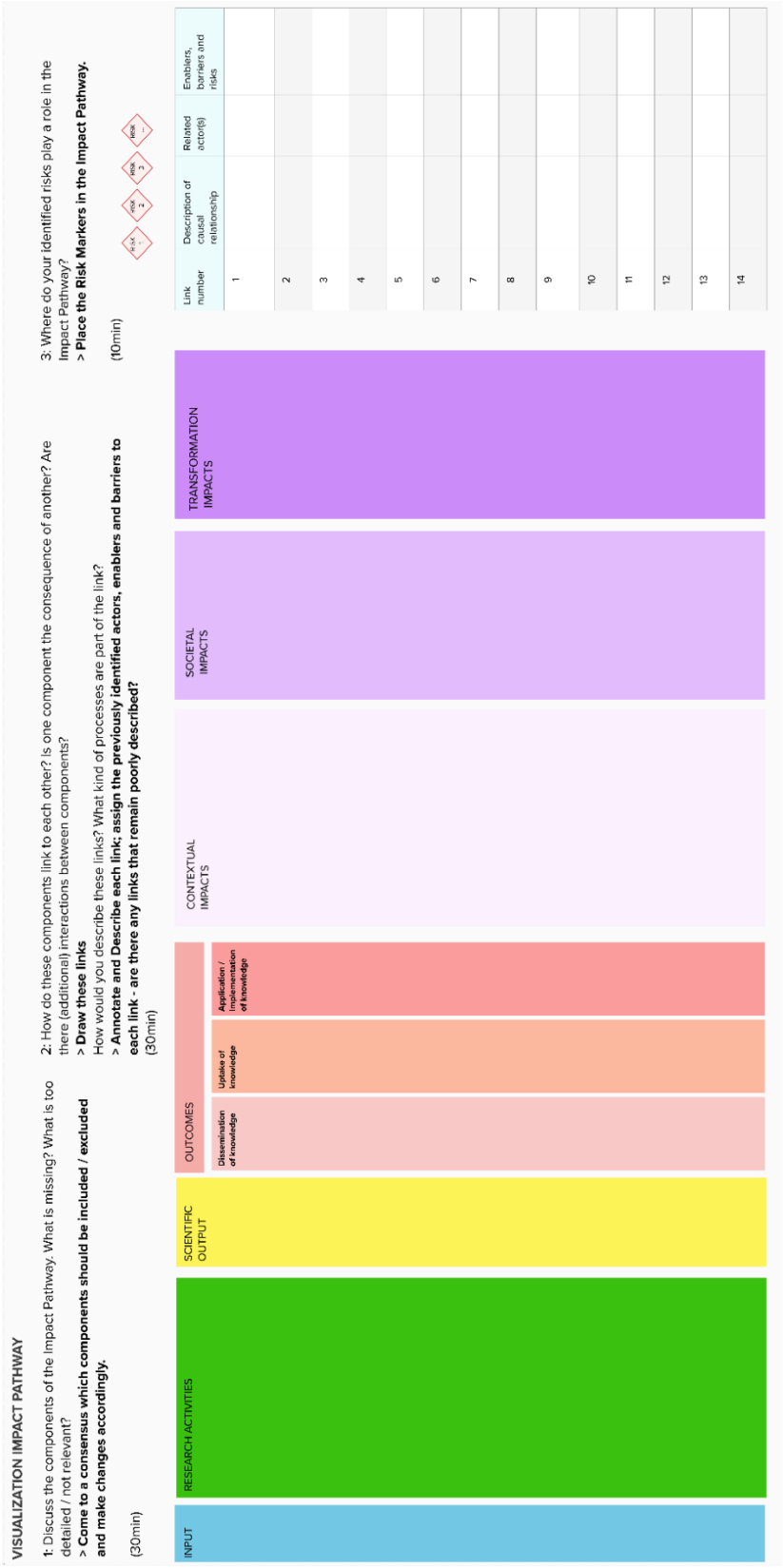
Enablers / Barriers	Related Actors or Desired Changes	Opportunities and resources		Risks
		Existing For example, contacts, institutions, events	**Needed** Include potential sources	
Enabler A	[related Actor]			
Enabler B	[related Actor]			
Enabler C	[related Actor]			
Enabler D	[related Actor]			

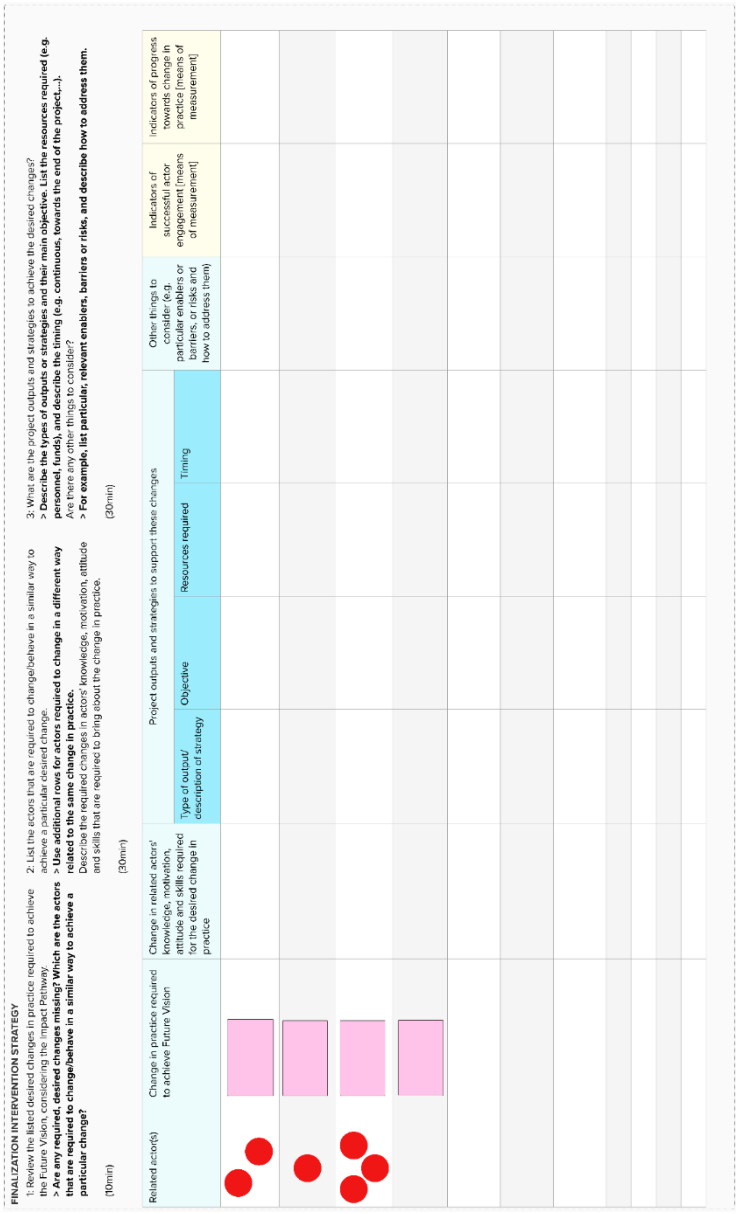
Risk mitigation strategy

For each of the listed Risks, estimate how likely they are to occur over the course of the project/program (likelihood), and what the magnitude of its effects on the successful reaching of project goals would be (severity). Then, outline how this risk could be mitigated, who would best be responsible to mitigate the risk, and at what time in the project/program mitigation of the risk needs to be carried out (e.g. more at beginning, continuously throughout, or towards the end of the project/program).

Risks	Likelihood	Severity	Mitigation	Who responsible	When
Risk A					

Workshop 4


VISUALIZATION IMPACT PATHWAY
1: Discuss the components of the Impact Pathway. What is missing? What is too detailed / not relevant?
> Come to a consensus which components should be included / excluded and make changes accordingly.
(30min)
2: How do these components link to each other? Is one component the consequence of another? Are there (additional) interactions between components?
> Draw these links
How would you describe these links? What kind of processes are part of the link?
> Annotate and Describe each link; assign the previously identified actors, enablers and barriers to each link - are there any links that remain poorly described?
(30min)
3: Where do your identified risks play a role in the Impact Pathway?
> Place the Risk Markers in the Impact Pathway.
(10min)
INPUT
RESEARCH ACTIVITIES
SCIENTIFIC OUTPUT
OUTCOMES
Dissemination of knowledge
Uptake of knowledge
Application / implementation of knowledge
CONTEXTUAL IMPACTS
SOCIETAL IMPACTS
TRANSFORMATION IMPACTS
Risk 1
Risk 2
Risk 3
Risk i
Link number
Description of causal relationship
Related actor(s)
Enablers, barriers and risks
1
2
3
4
5
6
7
8
9
10
11
12
13
14



FINALIZATION INTERVENTION STRATEGY

1: Review the listed desired changes in practice required to achieve the Future Vision, considering the impact pathway.
> Are any required desired changes missing? Which are the actors that are required to change/behave in a similar way to achieve a particular change?
(10min)

2: List the actors that are required to change/behave in a similar way to achieve a particular desired change.
> Describe the skills and knowledge required to change in a different way related to the same change in practice.
Describe the required change in actors' knowledge, motivation, attitude and skills that are required to bring about the change in practice.
(30min)

3: What are the project outputs and strategies to achieve the desired changes?
> Describe the types of outputs or strategies and their main objective. List the resources required (e.g. personnel, funds), and describe the timing (e.g. continuous, towards the end of the project,...).
Are there any other things to consider?
> For example, list particular, relevant enablers, barriers or risks, and describe how to address them.
(30min)

Related action(s)	Change in practice required to achieve Future Vision	Change in related actors' knowledge, motivation, attitude and skills required for the desired change in practice	Project outputs and strategies to support these changes				Other things to consider (e.g. particular enablers or barriers, or risks and how to address them)	Indicators of successful actor engagement [means of measurement]	Indicators of progress towards change in practice [means of measurement]
			Type of output/ description of strategy	Objective	Resources required	Timing