D6.4 –

Methodologies for Innovation agendas: Report summarising the practical methodologies behind innovation agenda formulation with local and regional authorities

WP6 – Task 6.2

Carla Alvial Palavicino[1], Kit England[2]

[1]*Climate KIC*

[2]*Paul Watkinss Associates*

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Summary

This report presents an overview of methodologies and approaches for the development and implementation of an innovation agenda, with the main purpose of sketching an innovation agenda approach that fits the goals and needs of regions participating in the Pathways2Resilience (P2R) project and engaging with the Regional Resilience Journey (RRJ).

This overview combines academic literature on key themes related to innovation agendas, specifically on mission-oriented and transformative innovation policy. While these approaches can vary considerably depending on the context of implementation, the report seeks to identify the principles and basic components of innovation strategies developed under a mission and/or transformation lense. These include grand challenge (vision), directionality, multi-stakeholder participation and multi-level governance. The report also highlights the economic case for funding transformative innovation activities, and specific mechanisms of funding relevant to European regions.

The report reviews 6 innovation agenda methodologies (Climate-KIC's and UNDP's portfolio approach, Inno4SD, PRI, MIOP, OPSI-OECD Portfolio approach), selected to showcase different dimensions of this approach. While some of the approaches focus more on specific methodologies and steps to formulate and visualise an innovation agenda (Climate-KIC, Inno4SD, Transformative S3), others pay more emphasis to the capacities, incentives and resources that organisations leading this type of work need to have in place (OPSI-OECD), as well as challenges and methods to coordinate among different institutions and policy goals (Fraunhofer, PRI).

Keywords

Innovation agenda, Innovation portfolio, methodology, tools

Abbreviations and acronyms

Acronym	Description
IA	Innovation Agenda
MOIP	Mission Oriented Innovation Policy
TA	Transformative Activity
DD	Deep Demonstration
SDGs	Sustainable Development Goals
STI	Science, Technology and Innovation
R&I	Research and Innovation
KCS	Key Community Systems
KEC	Key Enabling Conditions
PRI	Partnerships for Regional Innovation
OPSI OECD	Observatory for Public Sector Innovation – Organisation for Economic Cooperation and Development

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UNDP	United Nations Development Programme

Introduction

The Pathways2Resilience (P2R) project is supporting the Mission on Adaptation to Climate Change (Mission Adaptation) objectives by empowering at least 100 regions and communities to co-design resilience pathways and innovation agendas to become climate resilient by 2030. This support consists of €21 million to be distributed across 100 regions and communities via two call cycles, in addition to a range of support services and capacity-building activities to support the development of the resilience pathways and innovation agendas. P2R has developed a framework to support regions in their work to adapt and build resilience to climate change, the Regional Resilience Journey (RRJ). The RRJ is part of a larger framework on transformative climate adaptation, concentrating on the planning phase. The RRJ consists of multiple steps, each containing different expected activities and outcomes, as well as pointing to different methods and tools that can be used. The RRJ is an adaptable framework that helps regions to move from incremental to transformative adaptation. The framework provides a step-by-step guidance, activities, tools and milestones that allow regions to produce their climate resilience plans and innovation portfolios, by applying a systemic approach, just transitions principles and harnessing transformative innovation.

Work Package 6 ‘Support services on Key Community Systems (KCS) to design climate resilience pathways and innovation agendas’ aims to support the formulation of climate resilience pathways and innovation agendas, provide technical guidance, develop materials to provide practical support and capacity development. Task 6.2 seeks to support regions in identifying and implementing innovative options for KCSs, and methods for implementation.

The purpose of this report “Methodologies for Innovation agendas: Report summarising the practical methodologies behind innovation agenda formulation with local regional authorities”, P2R Deliverable 6.4, as part of Task 6.2, is to provide a general overview of “innovation agendas” and its use as a policy instrument to address complex challenges, in particular, climate adaptation. Based on this overview, the document seeks to sketch a methodological approach for the development of innovation agendas that align and support the development and implementation of climate adaptation pathways. In that effort, the document algins with the steps of the Regional Resilience Journey. The main goal of the document is to generate a common understanding within the context of P2R regarding what innovation agendas are and how these can contribute to the RRJ (Regional Resilience Journey) and overall, transformative adaptation of regions

This report is based on a literature review of relevant academic and grey (policy) documents, although not exhaustive, as well as guidance and cases of practice implementation of innovation agendas. Some of the definitions provided are being generated by the author and for the purpose of this document; hence, they do not seek to reflect the scientific agreement on specific terms, but rather, what this term in specific means for the P2R project.

This report is structured as follows: Section 1 provides basic definitions of an innovation agenda, the principle behinds it, and the different steps involved in designing and implementing an innovation agenda. Section 2 compares these steps with the steps of the RRJ. Section 3 provides an overview of selected innovation agendas methodologies. Lastly, Section 4 builds on the previous steps to sketch a methodology for innovation agenda formulation in the context of P2R.

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1 Innovation agendas: a definition

1.1 Definition

The term *innovation agenda* refers to a set of policy coordination tools and practices that identify and coordinate connected innovation actions aimed at addressing a common goal. It is important to note that innovation agenda is not a term used broadly in the innovation policy literature. In general practice it is used for the definition of sectorial or technology driven roadmaps or other mechanisms for long-term coordination among public and private innovation actors.

In recent years, innovation agendas have been used as a means to support the implementation of "Transformative Innovation Policies" and "Mission-oriented Policies". These two approaches refer to a relatively new way of understanding the rationale and role of the public sector in supporting innovation, from a focus on pure economic growth to a more explicit need to address societal challenges (Haddad et al., 2022; Schot & Steinmueller, 2018). It also implies a shift from an agnostic, passive approach to one where the state begins to invest in very early-stage research and innovation, picking the willing, to co-create new markets (Mazzucato & Dibb, 2019). Examples of this "innovation agenda" approach include the "shared agendas" developed by the government of Catalonia (Velasco et al., 2023), strategic innovation programmes in Sweden (Grillitsch et al., 2019) , German High Tech Strategy (Wittmann et al., 2022), Mission-Driven Top Sector and Innovation Policy (Harding et al., 2024), as well as Climate-KIC's own Deep Demonstration process. The approach is based on a renewed understanding of the role that the public sector can play, and has historically played, in supporting challenge-driven innovation, as in the case of the moon landings of 1960s (Mazzucato, 2011).

It is important to note that, when looking at the literature and practice of innovation agendas, different terms are used, from mission-oriented policy, grand challenges, transformative agendas, shared agendas, among others.

For the purpose of this document, an **innovation agenda** refers to:

> *"a regional innovation programme that supports climate adaptation goals of the region, and the iterative process by which a portfolio of interrelated and mutually supportive innovation actions are defined, coordinated, implemented and adapted. The concrete output of an innovation agenda process is a document that defines an innovation portfolio, including the policy and governance mix to support it. This process is generally comprised of 5 key stepwise components: 1) baseline development, 2) vision and directionality, 3) innovation portfolio, 4) supporting policy mix and governance structure, and 5) a system for monitoring and adaptive learning".*

These components are detailed in section 1.2. It is important to note that we use the term "innovation agenda" to refer to the broader process of alignment between innovation strategies and climate adaptation, and that the specific output that regions are expected to deliver in the context of P2R is a document describing their innovation portfolio, which includes a set of interrelated and synergistic innovation actions that support regional climate adaptation pathways, and the mechanisms for its implementation over time (i.e., policy mix, governance and monitoring and learning).

"*Innovation actions*" are defined as:

> *"any set of actions that takes existing and/or new knowledge and transforms it into products, frameworks or services that add value to one or more specific groups. Value, in this case, is*

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understood in the broader sense, not only monetary value but also improvements in quality of life (human and non-human)." (author's definition).

The innovation agenda supports the achievement of a "vision" or "goal" of societal relevance [e.g. climate resilience region or society], agreed by a set of societal stakeholders. It is a reflective process, that builds on ongoing actions and existing resources, structures, as well as societal expectations; and introduces a cycle of iterative learning to create further alignment across a variety of public and private actors and organisations, coordination, and stretching of their strategic visions and capacities to act, with the purpose of expanding the horizon of what is possible *(author's definition)*.

1.2 Innovation Agendas and climate adaptation

When it comes to innovation agendas as relates to the field of climate adaptation, it is important to set the scope of activities. Adaptation activities often divided into two types of activities, mainstreaming and dedicated adaptation (Watkiss & Hunt, 2015).

- Dedicated adaptation – Dedicated adaptation refers to actions primarily undertaken to reduce climate risks. Here adaptation is the primary goal.
- Mainstreaming refers to the integration of adaptation into a policy area. Here, adaptation is the secondary focus.

In reality, these adaptation activities are on a continuum (see Figure 1), with investment decisions including some degree of screening, through to dedicated investment (Barrett & Chaitanya, 2023):

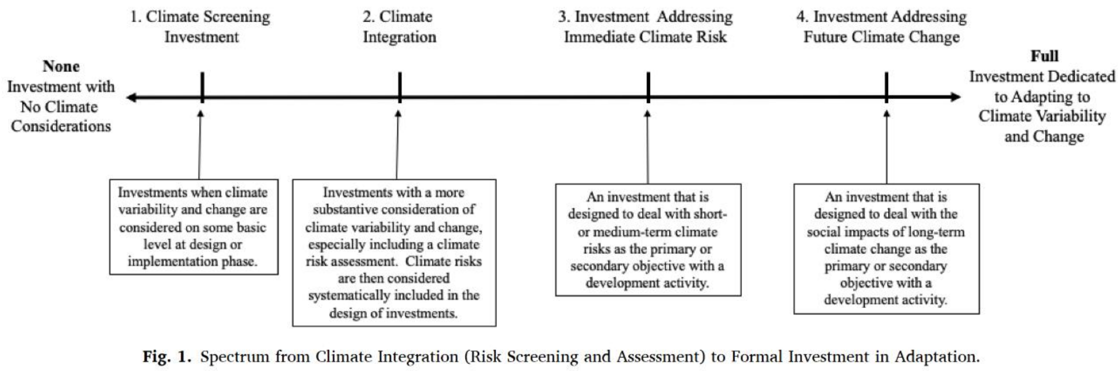

Figure 1. Spectrum from Climate Integration (Risk Screening and Assessment) to Formal Investment in Adaptation. Source: Barret and Chaitanya, 2023).

However, the role of innovation agendas in climate change adaptation has been underexplored. For the purposes of this deliverable, and P2R more generally, we are focused on Innovation Agendas as being about dedicated adaptation – i.e. constructing an Innovation Agenda which seeks to catalyse public and private investment into new solutions which reduce climate risks, either within the region itself, or in response to wider European or Global climate risks.

Although it is outside the scope of this deliverable, it is also important to promote mainstreaming of adaptation into wider Innovation Policy across Europe as an important adaptation activity for regions. For example, regions may wish to consider the impacts of climate change on its key economic sectors, and where consideration of climate proofing solutions could bolster wider economic competitiveness.

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1.3 Principles of innovation agendas

An innovation agenda is characterised by the following principles:

- **Having a shared "vision" related to a "grand challenge" or "societal goal".** The innovation agenda aims to address a complex problem of societal relevance, that require radical changes in society in order to be addressed, beyond technological fixes and incrementalisms (Diercks et al., 2019; Schot & Steinmueller, 2018). It requires institutions, societal expectations and practices to change. This vision is relevant to a large group of stakeholders within a given territory, and ideally includes the aspirations and expectations of who are most affected by the change.
- **Directionality**: the complex problems that an innovation agenda seeks to address often do not have one specific way to be solved. Instead, there are multiple routes that can be explored – through a portfolio, which will respond to different unfolding futures (Weber & Rohracher, 2012). Nevertheless, an innovation agenda provides a clear "direction of travel" for these multiple pathways – a set of "acceptable pathways" guided by set of agreed principles, which can be checked against specific milestones and goals, and revision moments.
- **Multi-stakeholder and multi-agency**: the innovation agenda is a participatory process that acknowledges that solutions to complex problems need to be constructed with those affected and gain legitimacy from the bottom-up to be implemented (Kuhlmann & Rip, 2017).
- **Reflexive, multi-level governance**: the innovation agenda involves multiple stakeholders and agencies, often both private and public, operating at different levels and sectors, with different mandates and goals. The process by which these different stakeholders coordinate is said to be reflexive because alignment does not happen overnight, neither it comes only from a top-down mandate. Rather, it is a process of mutual alignment that results from an iterative process of experimentation and learning. Different stakeholders will have different understanding, and a different stake in the issue, and the process of finding points of alignment evolves over time, as more knowledge of the problem becomes available, and new solutions are realized (Schot & Steinmueller, 2018).
- **Experimentation and learning**. Since the IA is an instrument that seeks to solve challenges that are complex and with deep uncertainties, it is essential to develop systems to monitor and learn regarding the results and outcomes of each of the innovation actions as well as their synergies, with the purpose of identifying early signals that indicate that the choices made need reformulation, at the portfolio level, policy mix and/or governance level. Compared to traditional monitoring and evaluation systems that focus on accountability, for IA the focus is on rapid and effective learning that leads to timely adaptation. The organisational capacities and incentives need to be in place for these learnings to be taken up and acted upon, as mentioned in the KEC.

1.4 Overview of the components of an innovation agenda

There are multiple approaches to generate an innovation agenda (see section 3), but in general, most approaches include the following components. Note that these components are not sequential steps, they might be presented in different order depending on the methodology used, and that not all methodologies include all steps.

i. **A challenge, vision and its directionality**
   - A shared challenge that is collectively identified by stakeholders.

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- A vision that is agreed (ideally, co-constructed) with a broad and relevant set of stakeholders
- The vision is compelling an ambitious.
- A method to assess that the agenda is moving in the right direction: this can be through milestones, checkpoints and sensemaking, metrics, others. Links to the directionalities of the agenda.

ii. **A baseline.** A set of processes that:

- Map the existing public and private initiatives, strategies, plans that seek to address the challenge.
- Identify the determinant factors that can contribute to address the challenge, including internal factors as well as external factors such as mega trends.
- Map existing technical, social and public innovations within a given territory
- Map existing policy instruments, goals and strategies, and any other enabling systems that can contribute to the challenge.
- Map the existing governance structures related to the challenge, and the ways in which these can enable and/or constrain the implementation of the agenda, including aspects such as institutional culture.
- Identify relevant societal expectations, cultural changes that can determine potential pathways of change.
-

iii. **A portfolio of innovation actions.**

- In this case, a portfolio is understood as a carefully selected mix of innovation actions that cover diverse sectors, areas and timeframes. The innovation actions in the portfolio vary in the level of uncertainty and risk that each bears, the timeframe in which they will lead to results, the level of effort required to complete the activities, etc.
- The portfolio can support localised experiments with climate adaptation solutions, that then can be scaled and deployed into more systemic solutions. These experiments can be a safe space for business participation and the testing of incentives and instruments to engage private sector in climate adaptation economy. (Harding et al., 2024).
- These activities are designed as a whole to (i) maximize impact – they are expected to build on each other, work together in for example, building specific services or markers and (ii) reduce risks.
- Innovation actions in the portfolio need to be supported by activities that do might require experimentation, such as capacity building activities, stakeholder engagement, etc. For innovations to succeed and scale, especially those that are more transformative, they might require capacities that are not currently widely available in the region (i.e. digitalisation), or supporting infrastructures and conditions (for example, shared facilities for testing, or regulations and standardisation that facilitate certain products or services). While these actions are not innovative per se, they are key to unlock the potential of innovations. These are different from the policy mix since they might not all fall solely in the realm of public sector actors.
- The innovation actions in the portfolio are selected and assessed upon agreed criteria. These could be level of risk/uncertainty, level of innovativeness (incremental, radical, disruptive), expected level of impact (incremental, transformative) or other. The "portfolio mix" is defined by these criteria and

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agreed among stakeholders who manage the portfolio (e.g. 70% low risk, low innovativeness activities, 30% high risk, high innovativeness).
 - The assessment of the portfolio mix can identify early on positive, as well as negative synergies between different innovation actions (Harding et al., 2024).

iv. **A collaborative governance structure and associated policy mix**
 - A mapping and understanding of the relevant policy strategies and instruments, and their corresponding agencies in relation to the portfolio of innovation actions that is to be implemented. This policy mix is based on the baseline assessment conducted previously, but now organised specifically in relation to the portfolio. policy mix is multi-level and multi-agency.
 - A collaborate governance structure to implement the innovation agenda, that is based on both top-down mandate and commitment, but more importantly, based on bottom-up experimentation, learning and alignment from the different agencies and stakeholders involved in the processes. Governance, in this case, is a process of mutual alignment and coordination, focused on creating synergies, shared goals and outcomes among different stakeholders and institutions.

v. **A system for adaptive learning**
 - A monitoring and evaluation system to understand the outcomes and effects of the activities implemented with respect to the challenge/vision, recheck process, reflect on successes and failures, and change direction if necessary. While the directionally provides the general “goals”, the monitoring and evaluation framework looks at the more specific outcomes, intended and unintended, and how they contribute to addressing the challenge.
 - The monitoring and evaluation system needs to be accompanied by the capacities and incentives for adaptive learning within the agencies and stakeholders implementing the agenda.
 - Building an adaptive learning environment might require time and changes to the institutional culture.

1.5 The economic case for innovation agendas

The Adaptation and Resilience to the climate change sector in the EU27 was worth €74bn in 2022/23 employing 874,710 people. The sector is forecast to grow at above 5% a year through to 2027/28 (Howard, S, 2023). In this context, it is important to explore the potential for innovation to support this growth.

Given their novelty, there is little ex-post assessment of on the economic benefits of challenge-led innovation strategies, such as innovation agendas. However, it is important to ensure that the use of innovation agendas offers value for money for European taxpayers. This section provides a brief summary of the literature on the economic benefits of innovation and the potential benefits of innovation agendas to help guide their development within Pathways2Resilience. It focuses on three areas: 1) the general economic benefits of innovation, 2) the rationale for government intervention (Department for Business, Innovation & Skills, 2014a), and 3) the wider effect on economic costs of climate change and adaptation in Europe.

Economic benefits of innovation

The major benefit of innovation is its contribution to economic growth – normally about a third of all growth in a country (Cameron, 1996). Through industry and government spending, countries boost economic growth. Normally, industry R&D spending is more significant than government investment. It is acknowledged that government intervention in earlier stage

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research and development is important to de-risk and enable further investment. Investments in innovation translate through into wider economic gains through a number of ways:

- **Higher productivity** – Investments in innovation can often lead to novel or more efficient processes which in turn produce more output for the same resources, or which reduce the requirements for inputs.

- **Competitive advantage** – Competitive advantage is a condition or circumstance that puts a company in a favourable or superior business position. Innovation can lead to a competitive advantage (Hana, 2013). For adaptation, this can be in the traditional production of goods and services that support adaptation, but also relates to the wider comparative advantage of the region – for example through a reduced exposure to climate risks compared to other places.

- **Spillover benefits** – Sometimes known as positive externalities, innovation is often known to create spillover benefits – where the search for one thing leads to the discovery of another, or new technological benefits, that can also produce wider managerial, social and economic benefits. These benefits tend to be localised, with foreign economies gaining significantly less from domestic innovation than other domestic economies (Cameron, 1996). However, the spillovers between academic research and some types of government R&D and the private sector, are typically found to be smaller than those between firms themselves (Griliches & Lichtenberg, 1982).

- **Fiscal benefit -** investment in innovation has tended to socialise risks and privatising rewards, but where the state takes a more active role (for example through equity investments rather than loans), the state can also benefit from this investment (Mazzucato, 2021).

- **Crowding in investments** – Use of public investment in innovation can help crowd in. One study found that public funding crowded in around 30% more private funding in the short term (Department for Business, Innovation & Skills, 2014a).

Whilst the economic benefits of innovation are widely accepted, quantifying the costs and benefits of innovation investments is challenging, this is because innovation costs and benefits vary as a technology evolves (Bunduchi et al., 2011), as well as because of the context specific nature of an innovation agenda.

Rationale for public intervention

Governments intervene in markets to address market failures (e.g. public goods, externalities, imperfect information or competition) or to improve the distribution of resources (GLAECONOMICS, 2008).

There is a role for Government to actively support innovation to address a well-established range of market failures (DBIS, 2014a). A major study by Technopolis for the UK government (Department for Business, Innovation & Skills, 2014b) identified eight categories of barrier that inhibit innovation in the absence of public support. These were:

- **Character of science and technology** – many innovations can depend on generation of knowledge that can be produced only over long periods of time or with major

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commitments of resources beyond the means or willingness to invest of individual organisations.

- **Market power** – the overall power of a small number of firms relative to the market overall. This can be positive or negative. Positive market power can increase the change that a firm captures the benefits from investing in innovation, whereas it can be negative where individual firms have too much market power which stifles innovation.
- **Externalities** – where technical characteristics of a good or service prevent property rights from being established or enforced, most commonly in relation to knowledge production. Where businesses cannot appropriate the full benefits of innovation, the incentive to innovate is reduced and this tends to reduce investment below the optimum level.
- **Information asymmetry** - High levels of specialised technical and/ or market knowledge mean that not all the economic actors involved have the basis for making informed decisions
- **Capability Failure** – where firms lack the skills, resources, ability to learn, absorptive and analytic capacity to capture innovation opportunities.
- **Network Failure** – This occurs where there is inadequate organisation for collecting, analysing and sharing information about innovation opportunities. The coordination mechanisms needed may range from loose ways of spreading information to close partnerships that overcome barriers between different parts of the system, such as along supply chains.
- **Institutional Failure** – This is where institutions (whether in the sense of 'organisations' or 'rules and conventions') operate in ways that impede innovation. Rules and regulation are not conducive to innovation and technological development. Government policy has the same effect
- **Infrastructural Failure** – Where there is insufficient human and capital investment in infrastructures critical to innovation performance by the state more generally.

Many of the above barriers are present in the space of adaptation and innovation. For example, the characteristics of climate risk and adaptation (including deep uncertainty and significant resources requirements for data such as climate services) make it challenging for individual firms to invest themselves. There are significant network failures, as well as information asymmetries.

Effects on the costs of climate change and adaptation in Europe

In addition to the traditional economic benefits associated with investment in innovation, the investment in adaptation innovation has the potential to generate a wider set of economic benefits.

Due to lags in the climate system the future trajectory for Europe through to 2050 is broadly comparable under most climate scenarios. Therefore, there are a set of economic damages locked in, the costs of which can only be reduced by adaptation. Plausible estimates of near-term adaptation costs for the EU27 to address these risks are estimated as being between €15-64bn/year through to 2030 with a 'central' estimate of €21bn/year, around 0.1% - 0.4% GDP and a higher proportion of the public budget (World Bank Group, 2024).

This will also have wider economic benefits by reducing the impacts of climate change.

Conclusion

To summarise, it is likely there is a strong economic case for the development of innovation agendas. However, detailed information on the particular economic impact or effectiveness in

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this context is low, and careful attention will need to be paid to maximise diffusion, as well as to identify and address the many market failures.

1.6 Financial case

A key source of finance to start this programme is the P2R cascade grants to regions which will build regional capability to define an innovation agenda and make the case for implementation. However, it is likely regions will need to take further action to be able to continue towards implementation. Therefore, the deliverable has undertaken a high-level review of available financing sources and instruments to support innovation agendas.

The general investment logic for innovation agendas for adaptation innovation is to use a small amount of public funds to catalyse a wider portfolio of private and third sector investment. The below section summarises potential sources and instruments to support regions to continue an innovation agenda through to implementation.

European Regional Development

The main funding source for innovation is traditionally the European Commission, through the European Regional Development Programme (ERDF). This provides grants and some loans for investments in infrastructure, applied research and innovation, investments in SMEs, as well as networking and knowledge exchange, information communication and studies and technical assistance. In the 2021-2027, the budget is €26bn.

The programme includes a dedicated specific objective for climate change adaptation, under the greener Europe priority objective. PO2 aims for "*a greener, low-carbon transitioning towards a net zero carbon economy and resilient Europe by promoting clean and fair energy transition, green and blue investment, the circular economy, climate change mitigation and adaptation, risk prevention and management, and sustainable urban mobility*". Within this priority objective, there is a specific focus on "*promoting climate change adaptation and disaster risk prevention and resilience, taking into account eco-system based approaches*". (Regulation (EU) 2021/1058 of the European Parliament and of the Council of 24 June 2021 on the European Regional Development Fund and on the Cohesion Fund, 2021).

Furthermore, climate change adaptation has been mainstreamed into the 2021-2027 ERDF programme, meaning that all objectives should consider adaptation. This is important since other objectives focus on innovation, but not on adaptation. For example PO1 aims to support "*more competitive and smarter Europe by promoting innovative and smart economic transformation and regional ICT connectivity (PO 1)*".

Finally, ERDF also allows the scope of Technical Assistance – which should allow regions to finance staff to help development and implementation of an innovation agenda.

Whilst the majority of ERDF is provided as grants, the programme also encourages the use of financial instruments – notably loans, guarantees and equity to enhance the value provided by the programme. Whilst in some cases for innovation, it is possible to provide loans, it is envisaged that grants will form the main source of financial instrument given the early stage of innovation and limited market maturity, though there may be the potential for some debt instruments like loans, albeit concessional.

In all cases, it is likely that regions will be able to use their public financing to crowd in further private and third sector financing. However, the rates of co-financing may need to be lower to reflect the wider economic barriers to financing adaptation.

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Alternative sources and instruments

In theory, the focus on innovation and the mainstreaming of adaptation into ERDF programme should mean there is a significant availability of finance to support the implementation of an adaptation innovation agenda within EU regions.

However, in practice this may be more challenging. The ERDF programme is a shared management programme. This means European Commission and national authorities in Member States, such as ministries and public institutions, are in charge of the programme. As a result, the ability to finance innovation agendas for climate adaptation will depend in part on whether member states and regions have included relevant specific objectives.

Therefore, an early priority in the development of financing approaches for innovation agendas will be to ensure that regions are able to leverage ERDF financing. Where it may not be possible to leverage ERDF to support implementation, additional sources of finance may include:

- Local economic development budgets – regions may have discretion to allocate more of their own resources to support innovation if they feel it is helpful
- Regional or national economic development agencies – Innovation is often the mandate of regional or national economic development agencies. They may have existing programmes that could be adapted to support the innovation agenda approach.
- National development banks – National development banks sometimes take equity stakes or provide early-stage funding or financing to companies developing new products and services.
- National Governments – National governments may use intergovernmental fiscal transfers to provide support for innovation policy.
- Challenge-led philanthropy – Some philanthropic institutions are beginning to adopt challenge-led approaches which may support adaptation
- Universities or higher education institutions – Many universities or higher education institutions have commercialisation programmes which support spinouts which may also be used.

Beyond this, further sources may be identified from the catalogue of sources and instruments and broader adaptation finance process developed in Task 5.2.

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2 Alignment between Innovation agendas and the RRJ

Under P2R programme, regions develop a bespoke Climate Resilience Strategy for their region. This method includes the creation of an innovation agenda. They can be informed by emerging adaptation needs in a region, as well as wider intelligence to understand the region's own strengths within the adaptation and resilience sector.

Similarly, for the purposes of the Climate Resilience Investment Plan, they form another action within the region's overall strategy, meaning a financing approach will also need to be developed similar to any other type of adaptation action.

The following table compares the different steps of the RRJ with relevant steps to build an innovation agenda, based on the guides and references reviewed in preparation for this deliverable. Overall, the innovation agenda "amplifies" the goals of climate adaptation strategies, from "climate resilience" to broader "socio-economic systems adaptation" (Harding et al., 2024). Note that the RRJ is aligned with the common innovation agenda process stated above, but brings the focus to climate change adaptation. In that context, the innovation agenda serves to catalyse and amplify the co-benefits of climate adaptation efforts, by harnessing local innovations.

2.1 Alignment between the RRJ steps and the construction of an Innovation Agenda

Table 1. Alignment between the RRJ steps and the construction of an Innovation Agenda

Step of the RRJ	Innovation agendas
1 Prepare the ground **1.1. Establish a Baseline,** that takes stocks regarding the region's climate risk, vulnerabilities, challenges and opportunities; as well as policies, regulatory frameworks and resources already in place to carry them out.	For the innovation agendas, it is necessary to include in the baseline an understanding of the existing programmes, resources, policies, etc that can contribute to address the vision; as well as the diverse understandings and policy goals, mandates and strategies for the agencies directly or indirectly involved in addressing the challenge. This will include existing research and innovation frameworks and strategies, both at national and regional level.
Prepare the ground **1.2. Understand the system**, making sense of the complexities of climate resilience, looking at parts of the systems and their relationships; moving across value chains, sectors and scales to uncover key interdependencies between challenges, in a multi-stakeholder process.	An additional aspect brought by innovation agendas is to map "societal expectations" and socio-technical path dependencies of the system. That is, to add a long-term perspective into the past and future(s) of the region to this system analysis.
1 Prepare the ground **1.3 Identify Risks and vulnerabilities**, including an assessment of current and	This step is not included in the innovation agenda per se. What might be relevant is an assessment of capabilities to innovate in the

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future climate risks, as well as an assessment of capabilities according to the Key Enabling Conditions.	region, which relates to the KEC of experimentation and learning, but also covers a more traditional understanding of innovation capabilities[1]. This step will also identify the vulnerabilities (social, economic, environmental, etc) that the IA can contribute to address.
Build a shared vision **3.1. Ensure ownership and commitment**, through securing high-level support from diverse stakeholders, and mobilising partnerships for collaboration.	This applies to the innovation agendas in the same way as described in step 3.1.
Build a shared vision **Explore possible futures**, starting from the existing opportunities and levers of change for a resilient transformation; and explore different possible futures, exposing trade-offs and value decisions to be made.	This is a step that is not necessary in building the innovation agendas but can be helpful in achieving an ambitious vision.
2 Build a shared vision **2.3 Agree on a destination**, through a co-creation process of a vision that is shared among a wide group of stakeholders.	The innovation agenda is guided by the same vision, which should also include an element of "directionality"; a set of principles, milestones that define multiple potential paths forward.
2 Build a shared vision **2.4 Build a Theory of Change**, underlying why a desired change is expected to happen, underlying assumptions and indicators.	See note above for step 2.3
3 Define pathways **3.1. Assess options**, that is, identifying options for climate adaptation and transformation to climate resilience, including various stakeholders and wide of range of technical and not technical solutions. For each, assess their effectiveness and impact as well as the enabling conditions required to implement them.	For innovation agendas, this can feed into the criteria and options that are included in the portfolio and the ways in which the portfolio is going to be assessed, including dashboards, decision points, feedback between options and pathways within the portfolio, etc.
3 Define pathways **3.2 Co-design portfolio of interventions,** defining adaptation and transition pathways and the changes that are envisioned to take place at each step. Connect to Action Plan, Investment Plan and Transformative Innovation Policy roadmap.	This would be the formalisation of the portfolio in relation to the policy mix necessary to its activation, translated into a document that is shared and agreed with all relevant agencies involved.

[1] Innovation capability is understood as "the ability to continuously transform knowledge and indeas into new products,processes and systems for the benefit of the firm and its stakeholders"(Lawson & Samson, 2001). At the level of organisation, it is also important to assess the capabilities and contextual conditions to experiment and learn (Schut et al., 2024)

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2.2 Role of Key Enabling Conditions

This section describes how KEC are mobilised in the development and implementation of an innovation agenda.

2.2.1 Knowledge and data

The implementation of an innovation agenda for a region relies strongly on the knowledge basis of that region, through their research institutes, universities, as well as the knowledge and innovation capabilities of its industries. When preparing the baseline for an innovation agenda, the region should assess is knowledge base, strengths and potential gaps.

More broadly, processes of innovation that tackle systemic problems benefit from knowledge co-creation and transdisciplinary collaboration, where different stakeholders, with different ways of knowing (not only scientific, but also tacit, experiential, lay knowledge) collaborate and create together solutions to a challenge.

2.2.2 Governance, engagement and collaboration

An innovation agenda is a process based on collaboration between different agencies within the public sector, operating in different domains and with different mantes (health, environment, housing, education, etc.), as well as at multiple levels (local, regional, national, EU). The successful implementation of an innovation agenda requires the coordination of these different policy goals, mandates and rationales, which is achieved through a process of both top-down (vision or challenge driven) as well as bottom-up alignment (instances in which two or more agencies collaborate to achieve a specific goal).

Furthermore, an innovation agenda seeks to mobilize the private sector as a provider and user of innovations, as well as citizens.

2.2.3 Finance and resources

As noted in section 1.7, the main logic of an innovation agenda is to use a small portion of public funds to catalyse private funding towards innovative activities.

2.2.4 Capabilities & skills

Capabilities and skills can be considered at two levels. First, the capabilities and skills at regional level in aspects such as innovation capacities of firms present in the region, absorptive capacities (i.e. the capacity to take new knowledge and add value), as well as capabilities and skills of technological sectors that the region would like to explore in the context of the agenda (e.g. digitisation, material science, nature based solutions, etc.). It is likely that the innovation agenda would require to be supported by specific capacity building activities, for instance, to improve the climate adaptation knowledge and skills of organisations supporting innovation and entrepreneurial activities, or in upskilling and reskilling workers moving to new economic sectors.

At the core are the capacities of agencies within the public sector developing and implementing an innovation agenda. An understanding of complex systems as well as the different types of innovation, their dimensions and cycle of scaling, choice of innovation policy instruments and their effects, is central to be able to manage dynamically an innovation portfolio that is able to evolve and respond to long-term challenges.

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2.2.5 Behavioural change

Innovation, particularly transformative or disruptive innovations, are most of the time accompanied by behavioural changes. Technologies enable and constrain the way we fulfil a specific need; hence, new technologies will prompt new social practices. Similarly, new behaviours are opportunities for the development of new products and services. For example, the introduction of mobile phones changes the way we communicate (text versus voice), or the way we use certain services such as banking. To enhance this potential and ensure a diversity of innovations that addresses various needs of communities within the region, in line with climate adaptation and societal goals, it is important to early on involve users and communities in co-design, experimentation and testing of innovations.

2.2.6 Experimentation, strategic learning and reflective adjustment

An innovation agenda is, at the core, a process of experimentation and learning. The approach brings together a variety of innovation actions that together, seek to create positive outcomes with respect to a systemic problem or challenge. Whether the portfolio is composed of more incremental or transformative innovations, it will generate both intended and unintended outcomes, and it is important to keep an open mindset to observe, capture and understand changes that emerge, as well as a governance and leadership system that allows to incorporate those learnings. This means ability to recognize failure early on, as well as potential negative consequences, and course correct and adapt the innovation portfolio accordingly. Importantly, it is useful to structure the portfolio not only in relation to goals and outcomes, but also learning questions or areas of exploration, where new knowledge needs to be created to make better decisions in the mid or long-term.

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3 Methodologies to define innovation agendas

This section provides an overview of six different methodologies available to build an innovation agenda. The methodologies described have been selected following a broad understanding of what an "innovation agenda" is, and as provided in Section 1, as a process to direct innovation activities in a specific territory to addressing a complex, grand challenge. The revision of methodologies does not intend to be extensive, but to represent the variety of approaches available. Additional reviews of related methodologies can be found in (Goulden & Kattel, 2024).

In that respect, methodologies vary considerably in their scope and approach. While some refer to the larger process of stakeholder engagement and policy coordination and learning of the innovation agenda, others are more specific to elements such as the building and assessment of the portfolio, or the design of roadmaps and pathways.

Each methodology is described in terms of the overall approach and the different steps involved in the process. Note that the methodologies selected vary considerably in their scope and focus. While some focus on the "mechanics" of building a portfolio (i.e. UNDP, SDG4INNO), others focus much more on the social and institutional infrastructure that is required to implement this portfolio (e.g., PRI).

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Table 2. Summary of methodologies for building innovation agendas

Methodology	Use case (scope)	Methodological focus	Implications for RRJ's innovation agendas approach
Portfolio approach Climate KIC – UNDP (EIT Climate KIC, internal document; UNDP, 2022)	This approach is best suited to address sectorial challenges, for example, urban mobility, waste management, or circularity in the built environment. Climate-KIC's DD approach has been used with city and national government, mostly in developing country contexts, to develop innovation portfolios in specific sectors. UNDP has worked with several national governments to define innovation portfolios for challenges related to sustainable development (mobility, health, etc.).	This approach focuses on the steps that are needed to build a portfolio, following a a vision-baseline-portfolio-learning and iteration logic, with different methods and levels of complexity to structure the portfolio. Climate-KIC's portfolio uses "positions" – statements – as a way to define the directionalities of the portfolio. The portfolio composition is highly complex with 3 criteria, but the process of evaluation on the portfolio is less clear. UNDP's portfolio approach distinguishes between solutions, which are incremental innovations, shorter term with quick win results; and experiments, which are innovations with a strong learning component, higher uncertainty and that require longer times to achieve results.	The Climate-KIC, UNDP approach showcases clearly how to define and use directionalities as a way to define the components of a portfolio. It also provides visual suggestions on how to identify synergies between its different elements and assess its performance.

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Partnerships for Regional Innovation PRI Action Book (Bianchi et al., 2024; Pontikakis et al., 2022)	Proposes a novel approach that uses the experience and capabilities built through S3 (Smart Specialisation Strategies) developed by European regions, in order to further develop a transformative, place-based innovation approach, that contributes to the goals defined by the European Green Deal.	The PRI playbook and ACTIONbook focuses on the governance, capabilities and enabling conditions for public sector actors and institutions to lead processes of innovation driven place-based transformation. The ACTIONbook serves as a catalogue of different tools, organised around 6 building blocks. These building blocks can be combined in a modular way depending on the pre-conditions of the region, the type of challenge that is to be addressed, and the resources available to do so. The approach expands the conceptualisation of S3, more focused on economic sectors and actors, to include the wider community and territory.	The PRI approach emphasises that the design and implementation of an innovation agenda is a process of collaborative governance that involves stakeholders beyond public sector, and where building legitimacy as well as capacities for learning and adaptation is key.
OPSI OECD Innovation Facets (OECD, 2022)	OPSI's innovation portfolio approach is specially designed to be used by organisations within the public sector. The approach stresses that different portfolio mixes might be suitable to the different mandates, history and role of an organisation. The Portfolio assessment tool is better suit to be used as an	This approach to portfolio design and management is based on guiding public organisation through a self-assessment process by which they understand their mandate, capacities, and the innovations that they are currently supporting. Organisations are then invited to diversify their	It introduces four facets (as opposed to types) of innovations that can be included in the portfolio: enhancement oriented, adaptive, anticipatory, mission oriented. The mix of the portfolio will depend on the challenge, the type of organisation that is being implementing it and its mandate, timeframe, among other factors.

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	organisation from the public sector, but not limited to, that seeks to integrate a portfolio approach in the way they introduce innovations to their work.	portfolio, to include the four facets of innovation and the synergies between innovations supported. The methodology also stresses the dimensions of incentives, capacities and governance required for a portfolio to be effectively implemented.	Nevertheless, it is suggested that having a mix of these innovations in a portfolio is relevant to give space for flexibility and learning and avoiding lock-in.
Inno4SD (Miedzinski et al., 2019)	This methodology is designed for public sector organisations working on Science, Technology and Innovation, who wish to tailor some of their activities and the activities that they support to the Sustainable Development Goals (SDGs).	This method provides a clear, stepwise approach to the development of a roadmap of innovations for a complex societal challenge. It emphasises the multi-level and nested nature of this process. While the proposed methodology is clearly defined, in practice this is implemented at different times, and to different degrees in different agencies and institutions, and alignment occurs through mutual learning and when the results of the portfolio implementation start to be realised. It is a good example of simplifying a complex process.	This methodology is the most aligned with the RRJ in terms of the way in which the steps are structured.
Smart Specialisation for Transformative Innovation (Foray et al., 2018)	This methodology has been developed following the Smart Specialisation Strategy (S3) approach, to include a transformative dimension. It is tailored to regions, particularly European regions, that seek to	This workshop methodology focuses on identifying local innovation capabilities and potentials, that combined can sketch "transformative activities", that is, a set of interventions that together set a	In contrast to other approaches, it puts more emphasis on the economic and territorial dimension of transformation, and the processes by which a region can transform their current economic activities. This

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	upgrade or transform their economic sector and economic development strategy. This methodology is implemented by public-private alliance.	new direction for the economic strategy of a region.	approach is not explicitly normative and does not include directionalities that guide these activities.
Fraunhofer's MIOP toolbox(Wittmann et al., 2022)	This approach is specifically designed for Science, Technology and Innovation (STI) policies and corresponding agencies, that would like to orient their activities towards societal goals.	Stepwise, it is similar to the approach of INNO4SD and well aligned with the policy making cycle.	Similarly to UNDP's and OPSI-OECD's approaches, it recognises that missions can have both incremental and transformational elements. This approach recognises and proposes archetypical pathways for incremental (acceleration) missions and transformative missions. It also highlights that a challenge might have both components.

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3.1 Portfolio approach Climate – KIC/ UNDP

The portfolio approach used by Deep Demonstrations in Climate KIC as well as UNDP is based on Chora Foundation's Strategic Innovation and Systems Transformation Framework, which is an iterative approach to build a portfolio of interventions. These approaches are presented together as they draw from the same original methodology by Chora Foundation, and follow a very similar logic, although with some modifications. The portfolios are understood as a tool for experimentation, sensemaking and learning regarding a specific challenge.

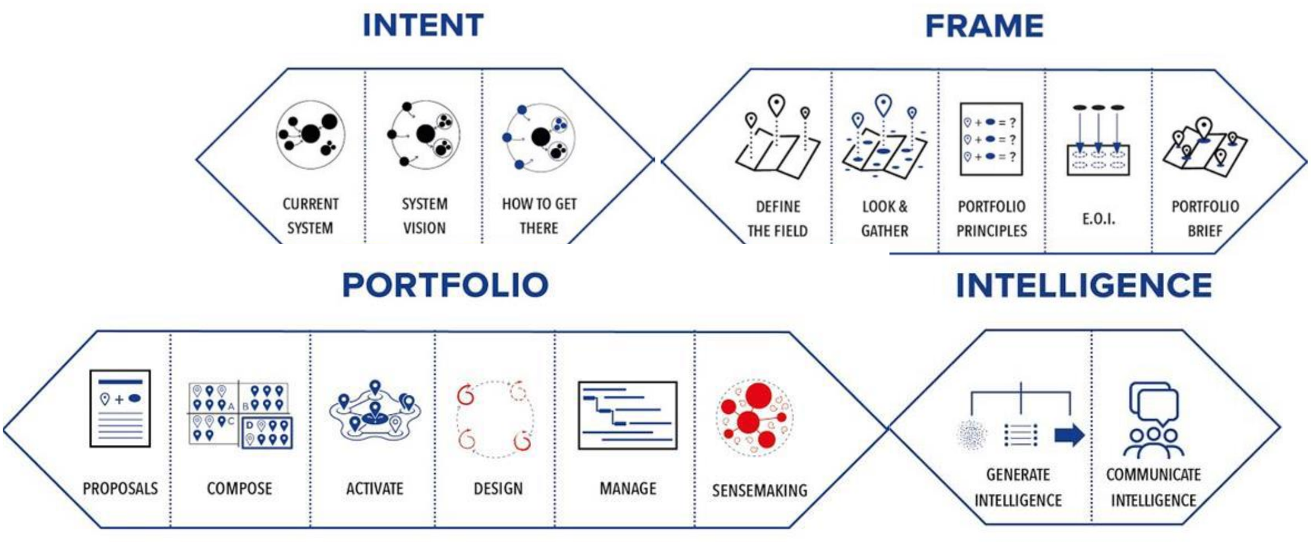

Figure 2. Steps of the Deep Demonstration Methodology

Following this overall architecture, Climate-KIC's portfolio approach within the deep demonstration methodology is comprised of 4 phases

i. **Intent**, which is the phase that establishes directionality, scopes needs, vision and objectives. It maps existing programmes and commitments to bring them into a portfolio logic. It is composed of three sub elements: understanding the current system, creating a shared system vision, and identifying pathways to achieve this vision
ii. **Frame:** defines the field of innovation action, understanding how innovation can achieve the vision defined in the intent phase. It is an iterative process that articulates why innovation is needed, where, what to leverage and how to test, experiment and learn about emergent possibilities and scaling potentials. It finishes with a portfolio brief. It is composed of 5 sub steps: defining the field, look & gather, portfolio principles, EOI (expression of interest), Portfolio Brief. The first sub-steps defines "positions", which are statements that indicate where innovation could be directed to achieve the vision (i.e. its directionalities). For example, "go where waste is being eliminated/refused", scopes towards innovations that remove waste from the value chain before it arrives to consumers. A set of positionings, agreed with relevant stakeholders, guide the selection of innovations that compose the portfolio.
iii. **Portfolio**: it starts with a call for proposals that seeks to gather solutions to catalyse change and/or learn about a specific challenge. These proposals go through a selection process, followed by activation, through a portfolio composition exercise. The innovation

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proposals selected are supported through dynamic portfolio management and regular sensemaking. It is composed by 6 sub steps: proposals are gathered, a portfolio composition workshop is run, the portfolio is activated – that is, assessed and redesigned, management of the different portfolio initiatives and their relationships, and sensemaking in relation to the results, changes and learnings that are being observed as the different initiatives of the portfolio are being implemented and lead to join results.

iv. **Intelligence** is the outcome of sensemaking and data drawing from the portfolio innovation experience, learning from multiple experiments.

The DD portfolio is characteristically represented as a “cube” with three axis (criteria) that map the different interventions, which are also mapped in relation to the different positions (directionalities) that were defined in the frame phase.

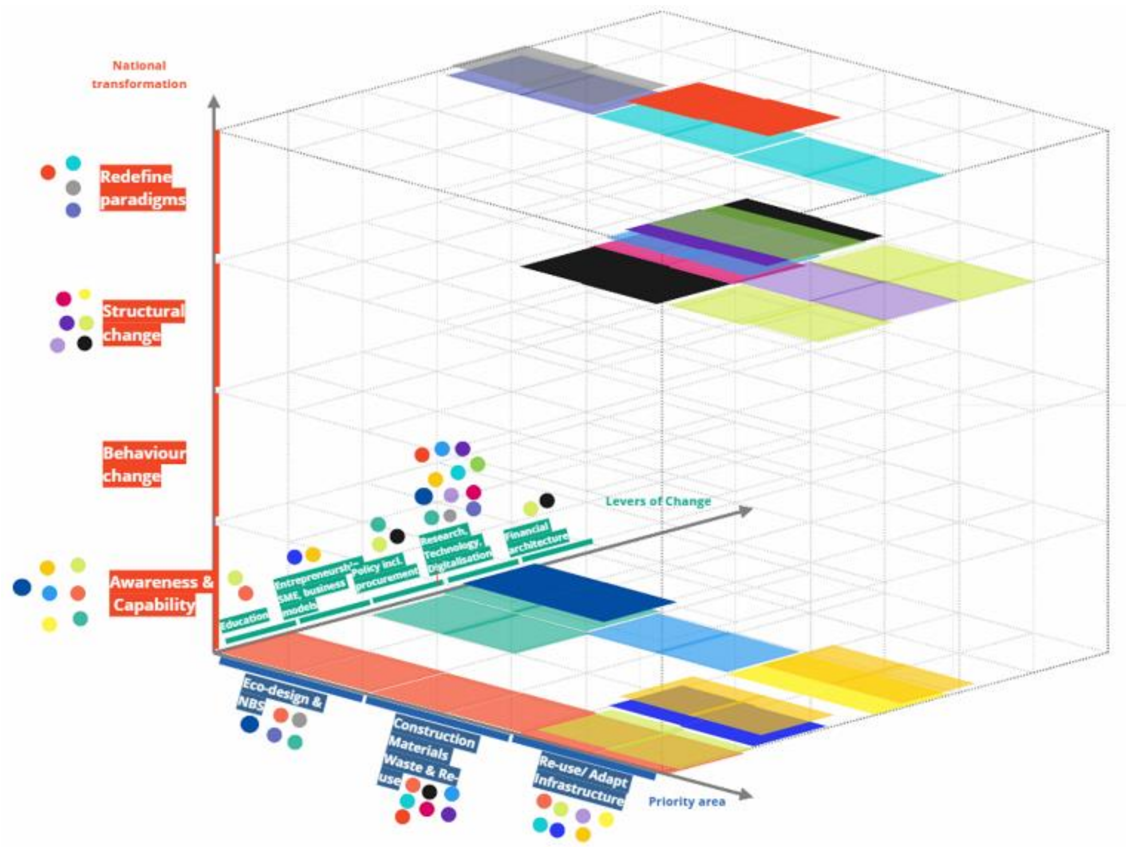

Figure 3. Example of a Portfolio defined through the Deep Demonstration Methodology, using for the case of Built Environment in the Slovenia Deep Demonstration. The three axis (criteria) are: priority areas in built environment (X), levers of change (Z) and national transformation areas, which as levels of transformation (Y). Each of the elements of the portfolio is also mapped in relation to the different “positions” as well as the specific interventions included in the portfolio, presented as dots (see Figure 5). Source: (Climate-KIC, 2024)

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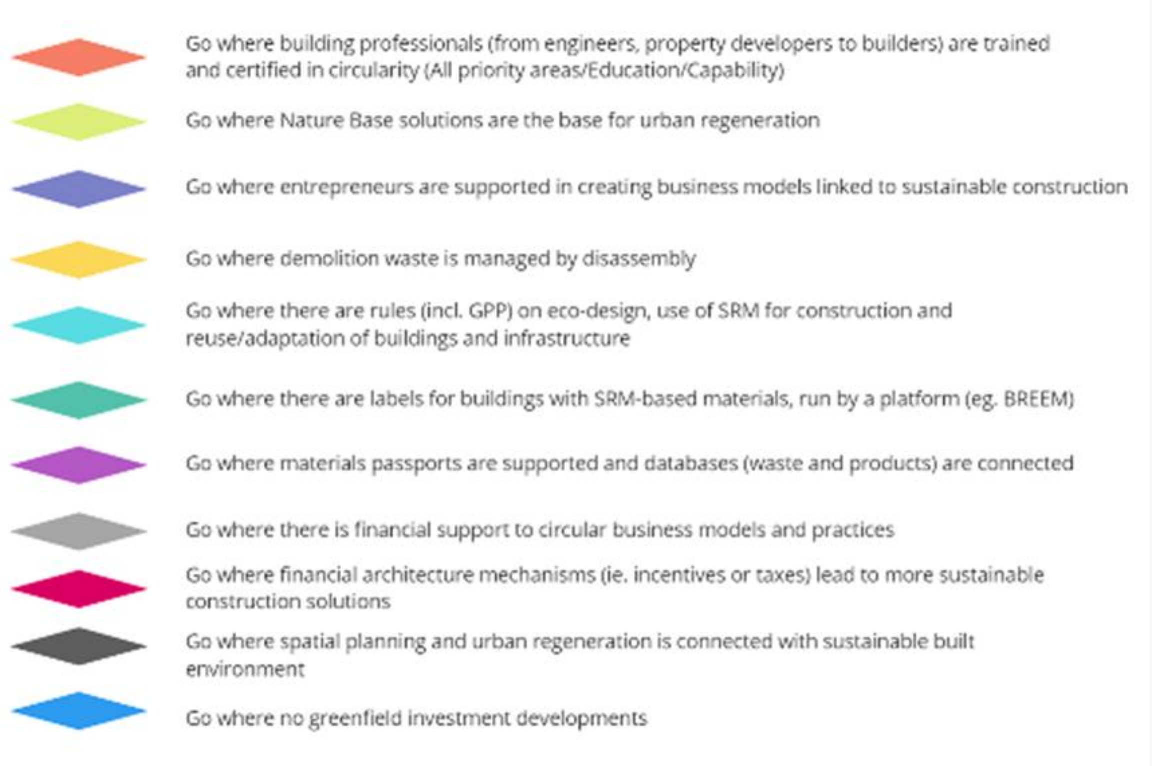

Figure 4. Propositions of the portfolio shown above

UNDP' defines a portfolio based approach as a "*methodology that seeks to develop, test, learn and scale a suite of interventions that are complementary and can shift complex systems by focusing on multiple interventions points at a given time. A portfolio is a platform for strategic learning and action: to understand the dynamics that occupy the problem space, and over time more accurately understand the aligned interventions*" ((UNDP, 2022, pg.3)

UNDP's approach is designed to address complex problems of public interest, hence it is emphasized that obtaining support from public officials and engaging the local community are pre-conditions to the development of a successful portfolio.

UNDP's methodology is based on three steps:

i. **Sense and frame**: data collection and initial learning about the contextual factors of the challenge, before engaging with stakeholders. This includes mapping macro-trends, as well as hopes, expectations and lived experiences of the communities affected by the challenge. The suggested methodology is rapid ethnography, supported by horizon scanning, ecosystem mapping and literature review.

ii. **Engage and position**: this is the exploration phase where stakeholders are brought in, where the core dynamics of the challenge are examined, identifying what needs to change, and articulating a preferred alternative reality and direction of the portfolio. The methods suggested are systemic design, problem space design, system mapping and strategic foresight.
In engaging with stakeholders, it is important to consider a variety of roles
    - Knowledge holders: those that possess technical expertise about the challenge, providing a fact-based perspective.
    - Champions: those in the position of influence and power that can mobilise momentum or desired action

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- Unusual suspects: those not usually considered in these processes but that can provide a perspective that challenges the status quo.

iii. **Transform**: this step takes the insights and intelligence from the previous steps to form a coherent set of interventions through a portfolio approach, co-designed and implemented with stakeholders. The portfolio is a way to work holistically to generate learning about pathways to impact (incremental and transformational). This step is iterative, continuously working in the problem-space, as the portfolio is expected to evolve as dynamic emerge and change over time. The portfolio might also include different scales, operating both at short and long-term. The methods are portfolio design, experimentation design and execution, advocacy, and portfolio sensemaking.

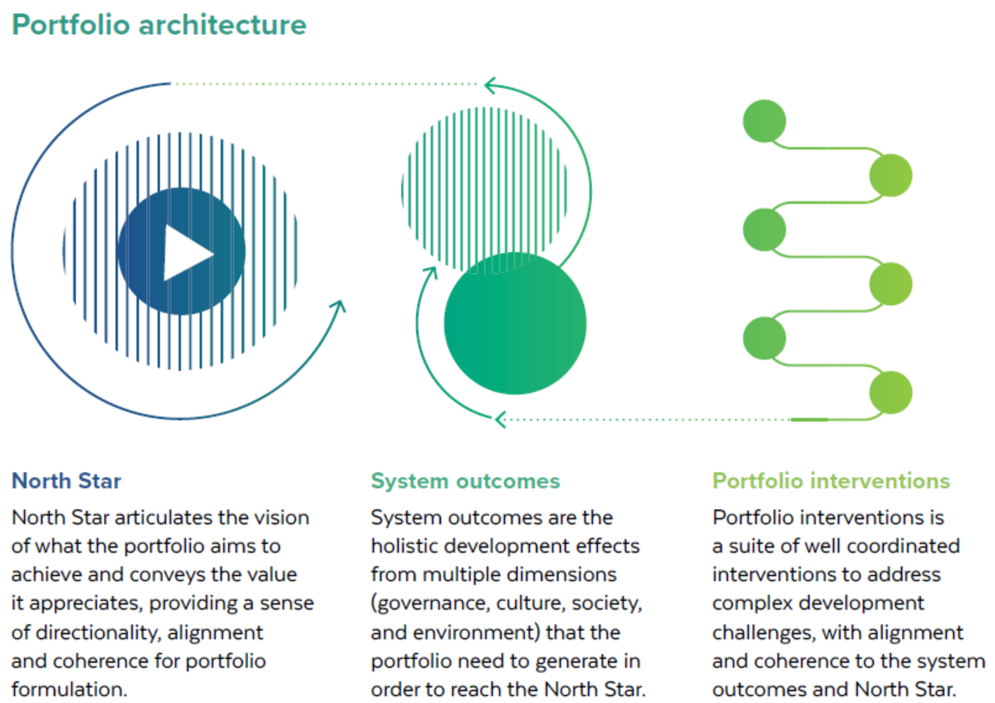

Figure 5. Portfolio Architecture for UNDP's systems design methodology

The portfolio design is divided in the following steps

- **Step1**: codifying and converging on the portfolio's strategic narrative, composed of a compelling narrative of the desired outcomes, what is required to achieve them, the desired interventions and where they should target. This is the orientation or "North Star" of the portfolio that gives a sense of directionality and alignment.
- **Step 2**: establishing the portfolio's working framework: it is important to consider the stakeholders being affected by the challenge in the design and revision of the portfolio, since this is an instrument of change that will be directly concerning them. To map the portfolio, it is useful to use two criteria that are different but compatible. The variables to map the portfolio could be: systems shifts, system stakeholders, stages related to the challenge, levers of change, time horizons, others.
- **Step 3**: experimentation design and portfolio intervention. The portfolio is composed of initiatives that are expected to generate impact (solutions) as well as initiatives that are more learning-oriented (experiments). Experiments should have a clear purpose (questions to be answered), assumptions/hypotheses to be tested, a data collection

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method, and a reflection on the implications of the results observed, both at niche level and in relation to the broader portfolio.

Table 3. Experiments and Solutions, the two types of interventions that compose a portfolio. Source:(UNDP, 2022)

Experiment	Solution
Discreet exploratory interventions designed to surface new or validating information about the merits or potential of an intervention or unknown information about the challenge itself. Innovation experiments are necessary to test assumptions, hypotheses and approaches at low scale to see what works, in what context and why.	Specific interventions that are implemented in spaces to address an issue (or suite of issues) embedded in the challenge space.
Experiments are best reserved for exploring spaces that remain unknown or ambiguous. They help us to reveal information that previously alluded us, therefore making subsequent decisions regarding how to intervene are evidence-based. Experiments can be thought of as learning-oriented interventions.	Solutions are implemented in spaces where context around what the issues are, including key reasons for why they exist are known. As such, solutions are designed to remedy these known issues and to achieve impact.
Experiments are one-time interventions designed to explore certain hypotheses/ assumptions around the challenge	Solutions are more permanent interventions that should be expected to be tweaked for optimal impact, but because they are being implemented in spaces of relative certainty, they are expected to endure for a particular amount of time (knowing all things have a shelf life of some kind!).

3.2 Partnerships for Regional Innovation Approach (PRI Playbook and ACTION Book)

The Partnerships for Regional Innovation is an initiative led by the European Commission's Joint Research Centre that seeks to become a strategic framework for innovation driven territorial transformation, that links EU priorities – particularly the EU green deal- to national plans and place-based opportunities and challenges, building on Smart Specialisation Strategies (S3). Within this framework, societal wellbeing and environmental gains are essential dimensions of innovation processes, in addition to economic prosperity. PRI has produced two guides for the implementation of this approach, the PRI Playbook and ACTIONBook, which are presented together in this review.

The PRI playbook proposes an approach to draw linkages across multiple policy domains and funding instruments, exploit synergies and address possible tensions to generate co-benefits for the economy, society and environment. It is divided in three operational and interrelated blocks:

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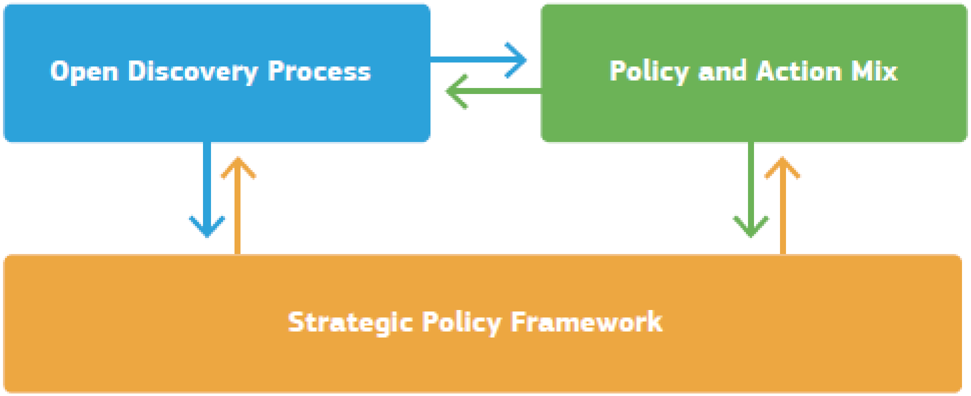

Figure 6.PRI Building Blocks

- A **Strategic Policy Framework** that encompasses broad perspectives, multiple policy domains and levels of governance, strategies and funding sources. It is based on the following key elements:
    - ***Diagnosis*** of the strengths, weaknesses, threats and opportunities for the territory in a multi-level setting.
    - ***Directionally***, given by the strategic framework policies that have been agreed at EU level (EU green deal, Cohesion policy, EU missions, etc.) and adopted and adapted at the national and subnational level. Directionality should be deigned in an open, broad participatory process through the lens of local challenges and prevalent social values. This should lead to the definition of priorities (desired outcomes) that will focus on future actions.
    - ***Partnerships***, as a coalition of relevant public and private actors that can contribute to or will be potentially affected by the chosen priorities and goals. This should include the ability to anticipate and manage potential tensions
    - ***Capacity building***, since PRI requires bigger coordination efforts and new roles in the public sector; this means, new organisational capabilities and individual competences. This can be understood as three key components (i) institutional capacity for policy design; (ii) institutional capacity for policy creation with stakeholders (ODP), and (iii) institutional capacity for implementation that includes monitoring and evaluation.
    - ***Policy Intelligence and Digital Infrastructure***, for the identification of relevant challenges and development trends, engage with broader stakeholders, and gather and provide evidence and lessons learned on the process.
    - ***Resource mobilisation***, through a higher level of aggregation (i.e. portfolios) that allows the coordination and mobilisation of diverse sources of funding.
    - ***Governance of government***, including both vertical and horizontal dimensions of governance across government agencies, and with external stakeholders.
    - ***Stakeholder engagement and co-creation***, through the Open Discovery Process and a challenge-oriented approach, working backwards from a goal to develop agendas.
    - ***Policy mix development***, that includes the necessary governance and administrative arrangements that can allow a diverse and tailored policy mix to happen.

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  - ***Build-in the European dimension***, through EU policies that provide directions as well as specific funding instruments and regulatory mechanisms to ensure that PRI is supported through the union common rules.
- An **Open Discovery Process (ODP)**, that enables engagement, deliberation and path co-creation with variable sets of stakeholders, that repurposes the participatory approach of Smart Specialisation Strategies towards sustainability, and introduces new ways of working across silos, working backwards from broad goals. It involves stakeholders such as vulnerable groups affected by the transformation, users, grassroots and civic society organisations. It introduces local missions to coordinate actions under a coherent directional logic, enabling the exploration of broad ranging policy mixes for system level innovation. The key features of the ODP are:
  - ***Openness*** in the goals of the process for these to become what stakeholders envision in an open and transparent process, as well as openness in the framing of innovation, from economic prosperity to societal and environmental wellbeing.
  - ***Directionalities*** focused on long-term societal wellbeing, shaped by societal stakeholders and local communities.
  - ***Working backwards from goals***, in a challenge-oriented manner and considering a user-oriented perspective.
  - ***Distinction between control and influence***, taking a strategic approach to the composition of the partnership that evolves over time.
- A **Policy and Action Mix**, that mobilises additional instruments to publicly funded projects, sequences interventions against other actions so that they result in synergies by design and co-opts additional actions by stakeholders. The policy mix is
  - developed as a response to opportunities and challenges identified during the Open Discovery Process,
  - able to identify and deploy the right tool for the job, considering where possible both supply and demand-side instruments, including market shaping and market creating policies.
  - Enabling the alignment and coordination of policy packages striving to also influence policies across policy silos and levels of governance.

The **ACTIONbook** (Bianchi et al., 2024) support the Partnership for Regional Innovation (PRI) initiative, and it seeks to identify activities that enable place-based innovation processes based on collective purpose driven change. It focuses on how to make policy activities more transformative. It is structured as a series of "activities" with associated tools, that combined can be used for different "use cases", such as building a partnership, setting up an open discovery process, among others. Each use case draws on a combination of the activities described in the ACTIONbook.

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USE CASE 2

Setting up an Open Discovery Process

The Open Discovery Process (or ODP) is critical to continuously engage with a broader range of stakeholders and co-create plans, for example, to design a local mission or formulating a policy and action mix. The ODP is based on inclusivity and transparency, and provides directionality by having stakeholders working backwards from societal problems to agree on a shared vision. For this, enabling and setting up a networked governance is key.

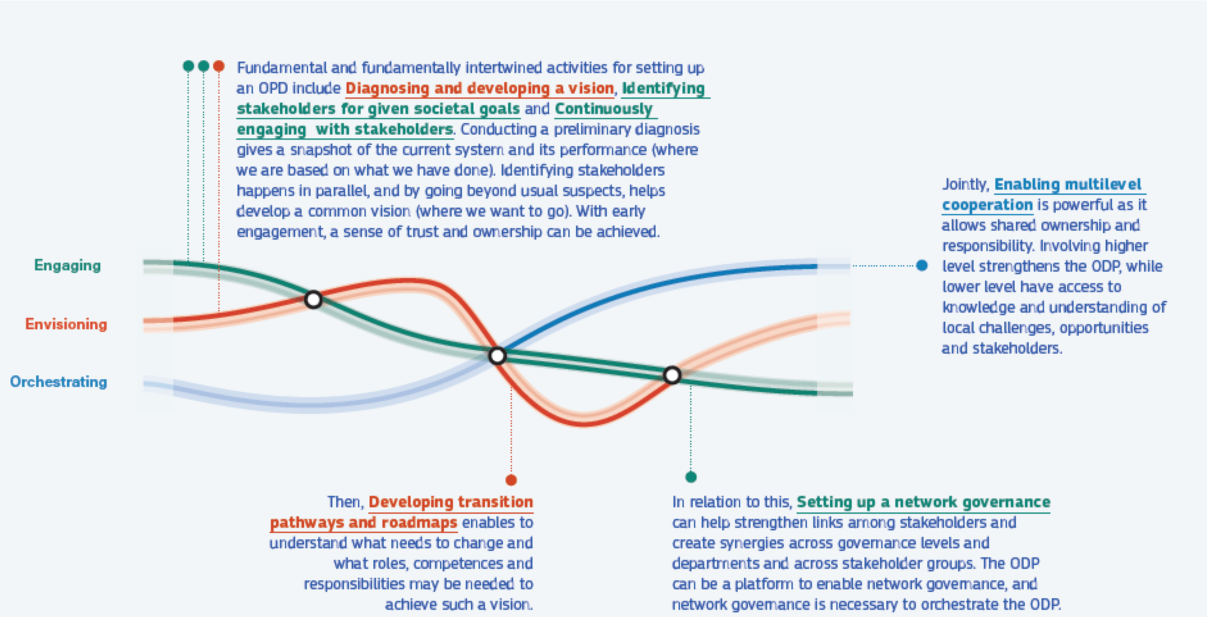

Figure 7. Use case ACTION book, in this case, the setting up of an Open Discovery process. This comprises activities related to engaging stakeholders, envisioning a desired future and orchestrating collaboration. Source: (Bianchi et al., 2024)

The following activities are identified as key building blocks of broader processes to set up, design and implement an innovation agenda. For each of these activities, the ACTIONbook provides a series of related tools that can be used in a modular way.

Engaging – identifying and mobilising the groups concerned who can help develop, implement and evaluate innovation strategy and policy.

Envisioning: which is the deliberate process of thinking about the future in which multiple groups continuously develop and apply actionable knowledge to anticipate change. Interplay between anticipation, evaluation and learning.

Orchestrating: orchestration considers how we can identify and take on board all relevant powers to make change happen. Agreeing on how to increase ownership of the transformation, setting up tailored governance structures. Involves vertical and horizontal coordination, interterritorial coordination and setting the agenda to rive this coordination. Build ownership and trust.

Designing: designing strategy: choice of policy, allocating resources, providing purpose and engaging with stakeholders, focusing on benefits of engaging with local ownership.

Implementing: deploying the strategy, coordinating the policy and action mix to supporting, prioritising funding, experimenting and learning and demonstrating results for continuous mobilisation, and scaling and mainstreaming for successful innovations.

Learning: policy learning as an iterative process, that includes processes and organisational arrangements.

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3.3 OECD Innovation Facets Portfolio approach

OECD – OPSI (Observatory of Public Sector Innovation) introduced the Innovation Portfolio approach as a way to structure innovation processes in the public sector to address complex challenges, where there are high uncertainties and the traditional approach of single pathways and targets is not suitable. Portfolios respond to the need for pluralistic strategies in innovation activities.

A portfolio approach to innovation is a set of practices that seeks to detect, assess and develop new opportunities by effectively managing resources across selected projects. It is a way to minimize the risks and foster opportunities, identify and analyse synergies between actions, evaluate results beyond single interventions and avoid innovation lock-in to ineffective or unsuitable strategies. In contrast to private sector, challenge-led, public sector portfolio include success criteria that are varied and often qualitative in nature, with impacts that have longer time spans than in the private sector and encompass non-monetary value propositions.

The innovation portfolio management approach includes the following aspects:

- **Portfolio logic and perspective** – provides a strategic focus on a plurality of overall activities by connecting short-term actions to long-term goals, rather than focusing on individual projects.
- **Responsibilities distribution** – identifies accountable areas for overall innovation portfolio management and its different components.
- **Knowledge co-ordination** – adequate subject expertise is essential as is the ability to integrate, synthesise, and translate knowledge between disciplines. This also includes outreach to other partners and incorporating knowledge external to the organisation.
- **Tailored to project investments** – different types of innovation efforts may require different types of funding. Most small-scale projects do not require heavy investment, while transformational efforts may need consistent and extensive funding.
- **Co-ordination of innovation activities** – provides an overview of the innovation lifecycle including identification challenges, and evaluation of expected impacts and costs. It also establishes stage-gate (gatekeeping) controls to ensure continuity of the process and effective resource optimisation.
- **Holistic view of innovation efforts** – helps develop a shared vision of current innovation activities and find common understanding and systemic linkages across the entire innovation portfolio.

OECD-OPSI developed the Portfolio Exploration Tool to support the development of innovation portfolios. This is an online self-assessment tool open to be used by individuals and organisations. The tools help the user to select a mix between four innovation “facets” that highlight the different purposes and intents that an innovation can have within different types of (public sector) organisations and their mandates:

- **Enhancement oriented innovation** upgrades practices, achieves efficiencies and better results, and build on existing structures. This facet of innovation generally utilises existing knowledge and seeks to exploit previous innovations, building on existing processes and programmes to achieve greater efficiency. These are the innovations that more often are the focus of governments.
- **Mission oriented innovation** sets a clear outcome and overarching objective for achieving a specific mission, often an ambitious outcome or goal that serves as driver and uniting force for innovation that drives ecosystems platers to work together to achieve

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the goals. There is a clear sense of what needs to be achieved, even if how to get there is not yet clears and will require new learning and knowledge.

- **Adaptive innovation** tests and tries new approaches in order to respond to a changing operating environment. The purpose of innovation is the discovery process itself, driven by new knowledge or changing environment; and these innovations help adapt to changes. Sometimes these innovations challenge the status quo and existing missions.
- **Anticipatory innovation** explores and engages with emergent issues that might shape future priorities and future commitments. These are innovations that often involve high degree of uncertainty, which is addressed through the exploration of new possibilities, learning about how new things could/should work over time.

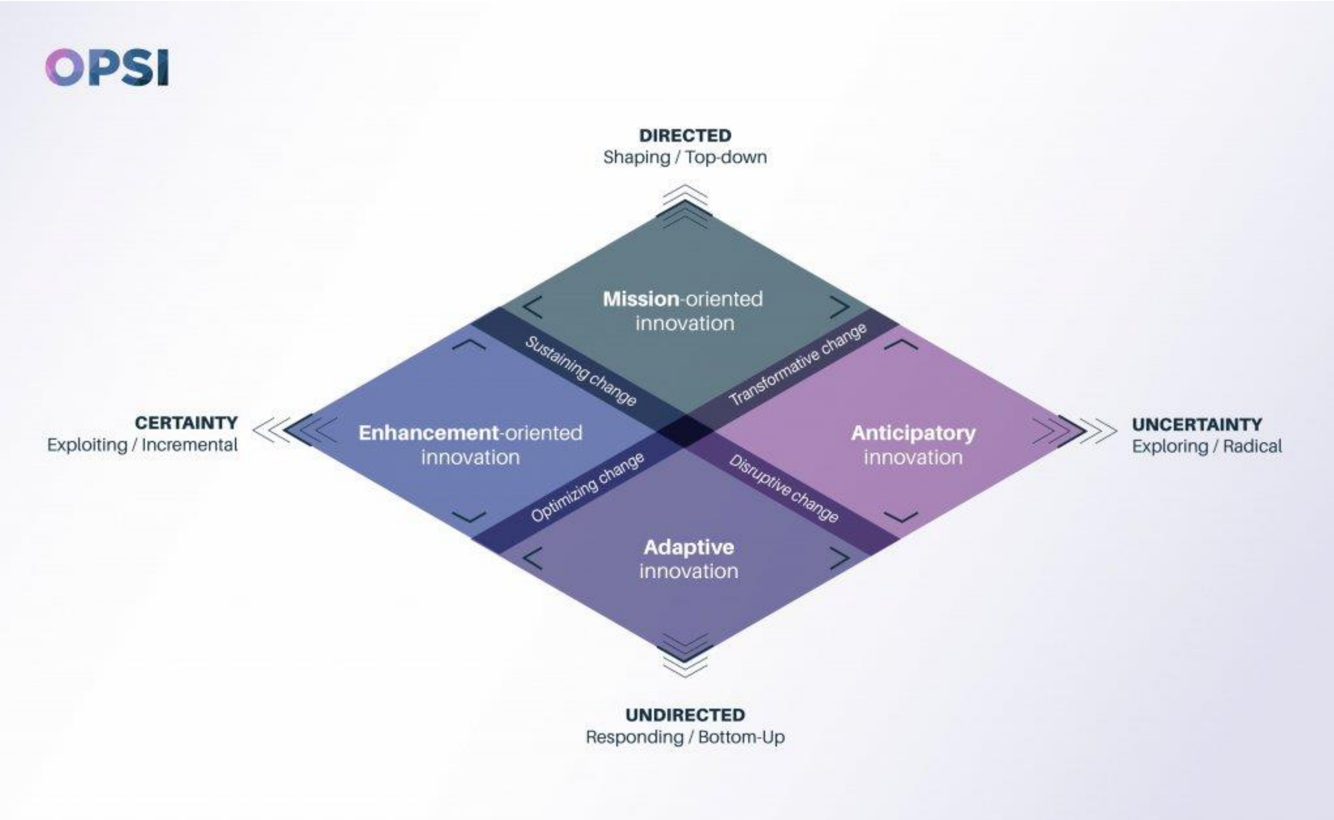

Figure 8. Four facets of innovation as described by OECD-OPSI

The portfolio assessment tool suggests a mix of innovations of the different facets that is suitable for a certain organisation given their internal structure and mandate. For example, an organisation with a strong mandate such as addressing climate change might have a portfolio leaning towards more mission-oriented types of innovation. However, the approach argues that all types of innovations should be balanced within the portfolio as they cover different aspects of the innovation process and can feed into each other. Each type needs to be supported accordingly, acknowledging that the processes and skills for incremental innovations are not the same as anticipatory innovations.

The tool also proves some guidelines on how to “manage” this portfolio, stressing that a portfolio and each of its innovation needs to be evaluated, assessed and reforumulated individually and as a whole over time in response to internal and/or external changes.

A good portfolio management practice includes:

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- **Sensemaking,** as a systemic analysis and meaning created around the collective experiences of innovation within the organisation, vis a vis its strategic aims, purposes and synergies between projects
- **Stewardship,** with clear responsibilities over looking at all the innovations that compose the portfolio and coordinating them.
- **Supporting structures** with all functions of the organisation (HR, procurement, etc.).
- **Different purposes** – allowing for different types of innovation as a means to avoid lock-in.
- **Synergies** – seeking and exploring opportunities and strengths among innovations.
- **Resourcing** – clear overview of how different innovations and activities are resources in terms finances, capabilities, skills, that feeds into strategic decision-making within the organisation.
- **Monitoring** – in ways that make sense for the purposes and scope of each innovation
- **Evaluation** – to assess changes in the ground that have resulted from their portfolio and how they feed into the strategy
- **Learning** – with effective learning loops across the organisations and people involved, including successes and failures.
- **Communications** – why and how the portfolio is managed needs to be effectively communicated to generate engagement and buy-in.

3.4 Inno4SD

This guide uses the roadmapping methodology for Science, Technology and Innovation (STI) policy makers to enable the design, planning and implementation of public policies targeted at the Sustainable Development Goals (SDGs), that is, areas of focus and challenges relevant for sustainable development.

Technology roadmapping is a well established technique used to support technology management for decades. It encompasses a variety of multi-stakeholder methodologies, but what they have in common is three guiding questions:

i. **where are we now?** an understanding and reflection on the current state of development
ii. **where do we want to go?** An explicit purpose expressed as a vision and strategic priorities and targets
iii. **how do we get there?** A process to achieve the desired vision with a defined time horizon and timelines, milestones and intervals.

The resulting roadmap has three future-oriented elements: the vision, the pathways (high level guidelines) and the action plan (detailed implementation). The emphasis given to each of the components will differ in emphasis depending on the goal, scope and context of the exercise. Pathways describe the causal mechanisms of change expected to be triggered by various innovations over time, and the role of policy instruments in enabling the desired changes. Emphasis on pathways can be useful in cases where the vision is less clear. An action plan is a set of timebound activities with associated responsibilities. The roadmap can be used to communicate an action plan.

The STI for SDG policy roadmap is composed of three layers, as shown in Figure 10:

- Vision and strategic context
    - Vision, targets and milestones, including the SDGs.
    - External drivers and trends.
- Innovation and transition pathways

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  - o Key innovations and innovation pathways to achieve the targets
  - o System conditions enabling and accelerating innovation (finance, market demand, technology trends, etc.)
- Policy action plan
  - o Policy instruments (instrument mix)
  - o Governance level and governance mechanisms
  - o Evaluation and policy learning
  - o Capacity building.

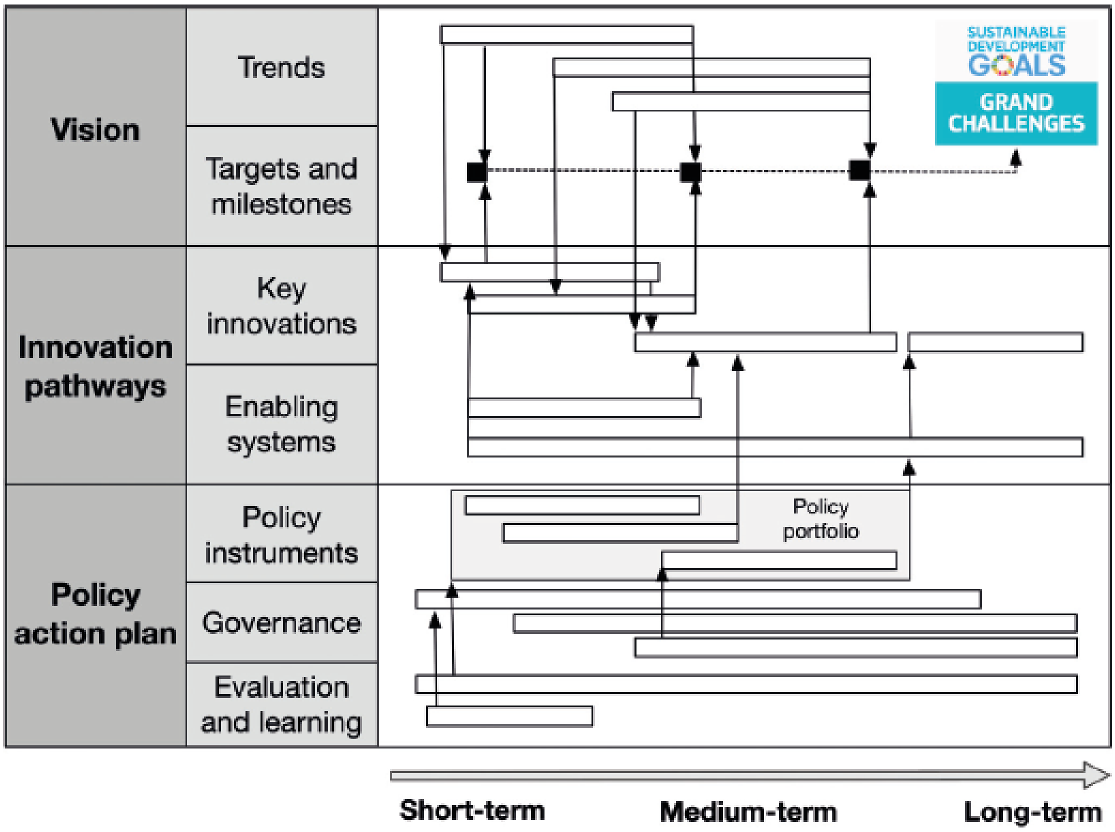

Figure 9. Generic architecture for STI for SDGs policy roadmaps

It is important to note that the roadmap process and implementation is a nested and iterative approach, that is, it is incorporated at various levels that coordinate and complement each other, seeking complementarity between various STI policy processes.

The steps of building an STI for SDG roadmap are the following:

1. Scope and ambition
   a. Agree on a broad challenge and mission to be addressed by roadmap
   b. Relate the challenge and mission to SDGs
   c. Engage key stakeholders
   d. Secure necessary resources
   e. Agree on organisation and governance of the exercise
   f. Embed it in the relevant policy and political process.
2. Baseline analysis
   a. Define scope: quick scan vs in-depth analysis
   b. Review the political, etc. situation of the region

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   c. Review existing data on the challenge and existing solutions, limiting factors
   d. Perform stakeholder and innovation systems analysis
   e. Integrate the sustainability and innovation analysis: identify targets, concrete projects.
   f. Visualise, relate and map the impact, innovation and policy outcomes and other relevant outputs.
   g. Generate reports and comms materials.
3. Vision and goals
   a. Agree on the main objectives, targets and time horizon of the roadmap, explicitly linking them to the impact hot spots
   b. Co-create a shared vision for the roadmap. Brief scenario description that includes essential outcomes and descriptions of enabling conditions.
   c. Set quantifiable goals and targets
   d. Inventory the key elements of the vision that will be followed in the pathway descriptions and action plans.
4. Innovation pathways
   a. Explore alternative innovation pathways for addressing the impact "hot spots" and for accomplishing the missions
   b. Identify drivers, enabling factors and barriers of R&I including market and system failures, that require adaptation to enable mission oriented R&I
   c. Select portfolios on R&I projects (incl.experimentation and demonstration) to achieve impacts on the targeted "hot spots" in short, medium and long term.
   d. Agree on expected timelines of implementation by indicating lead times to impact of research and innovation projects
5. Policy action plan
   a. Explore key policy instruments and policy portfolios to provide direct and indirect support to the selected innovations.
   b. Co-design a long-term policy action plan with goals, targets and timelines of action (including instrument sequencing) led by public and private actors in the short, medium and long term.
   c. Make sure that the policy action plan is embedded in the relevant policy and political processes.
   d. Assign short and medium-term actions to stakeholders, notably on experimentation and demonstration projects for the mission.
   e. Agree on indicators for monitoring and evaluation of the roadmap.
6. Implementation and policy learning
   a. Set up governance mechanisms and build policy learning environment supporting the implementation and ongoing reflection on the roadmap.
   b. Establish dedicated capacity building processes and design learning environment for stakeholders involved in the roadmap.

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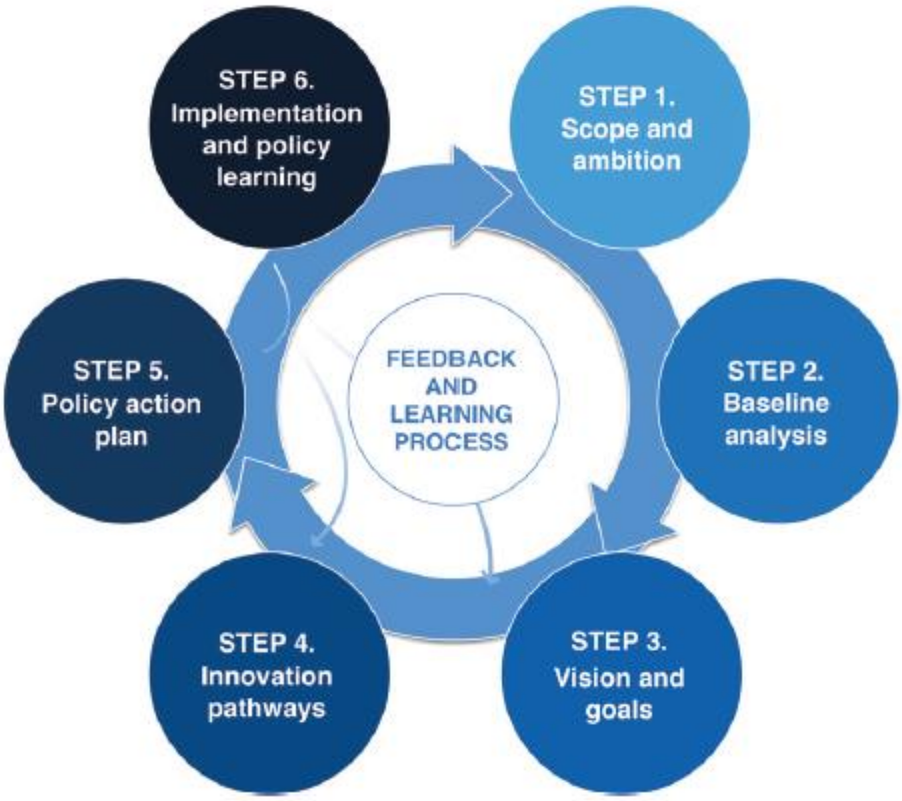

Figure 10. Generic steps in STI for SDGs policy roadmapping process

3.5 Smart Specialisation for Transformative Innovation

This methodology is an adaptation of the S3 (Smart Specialisation Strategy) approach to take a transformative lense. The logic od S3 is to create a framework to get more focus and coordination among entrepreneurial activities, which includes sectors as well as alignment on modes of transformation of sectors or establishment of new ones. This focus is operationalised through the concept of Transformative Activities (TA).

A TA denotes a collection of innovation capacities and actions (beyond sectors or individual projects) that are identifiable within an existing structure and to which extra-regional capacities can be added, and that is oriented towards certain structural change. It serves as a catalyst for collective actions by firms, suppliers and research partners. A transformative S3 means to identify a small number of TA, which then can be developed and supported.

The approach is based on the following principles:

- Targeted spending (focus and priorities) realising potential spillovers, scale and scope economies from the constitution of critical mass of projects and actors involved in a common direction for structural transformation.
- Target and priorities are not limited to the provision of aggregate/generic capacities but are established on the recognition that innovation in any given filed or sector does require specific capacities and coordination devices.
- Targets and priorities are not sectors, but are models of transforming sectors or establishing new ones (i.e. TA).

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- TA should not consist of a big and large scale project, but a large number of smaller projects, which are related and coordinated and cover all problems of input provision and coordination arising from the development of a TA.
- Paths and modes of development of a TA are not planned ex ante in a top down manner but are discovered by actors.

The workshop methodology is divided in three phases

- **Phase 0: pre-determination of covered fields**. This phase requires the development of a comprehensive understanding of the topic of structural change at stake, in order to be able to determine a range of options in terms of priorities and activities, but not too broad, to be able to create connections and relations among the capacities, activities and others. This step identified the right composition of participants in the room in terms of varieties of expertise and perspectives. This step also communicates the direction of change, which should be based on formal evidence regarding the regional capacities.
- **Phase I: identification the set of innovation capacities** necessary for the aspired transformation, based on a reflection about existing capacities and opportunities presented by new technologies and challenges that can drive and support the process of structural transformation. Novel capacities, potentials and opportunities are assessed with respect to their economic relatedness.
  Relatedness is defined in terms of similarities between activities that capture the cognitive dimension of capabilities, implying learning (Boschma, 2017). For example, whether projects share similar inputs, capacities, seek similar business models, might use similar platforms, or are complementary to each other. Relatedness predicts synergies and spillovers, and it can be a good predictor of project success.
  The substeps of this phase are the following:
    - Participants identify concrete future projects that are enabled through a combination of existing capacities/potentials in relation to the opportunities for transformation.
    - Map these projects in the capacities/opportunities framework (Figure 10)
    - Identify relations among individual projects. The collection of related projects represents the innovation capacities constitutives of a TA. TA are assessed in relation to the existing availability of human resources, specific skills and competences.

  Priorities should be identified at the right level of granularity, not at a sectorial level but at the level of activities that have the potential to transform these sectors or establish new ones, e.g. not the energy sector, but the development of smart materials for renewable energy.

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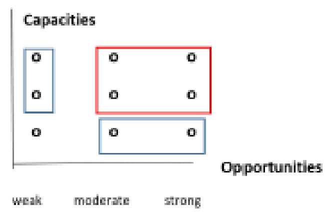
Mapping Projects



Note: The table is highly stylised. The goal is to generate a table with as many projects as possibly - several being located in the same areas (*i.e.* a given node in the stylised table typically represents several projects)

- Projects are evaluated (weak/moderate/strong) with respect to existing capacities and opportunities for transformation
- Based on this mapping four classes of projects are identified:
  - Projects with moderate to strong capacities and moderate to strong opportunities are considered as regional priorities (red)
  - Projects with strong opportunities but weak/moderate capacities should be considered as priorities for inter-regional cooperation (to "import" missing capacities) (blue)
  - Projects with strong capacities but weak opportunities should be considered as priorities for re-allocating critical assets (strong capacities) to meet stronger opportunities (blue)
  - Projects with weak capacities and weak opportunities are eliminated
- Projects that are not eliminated (red and blue) will be considered as constitutive of a Transformative Activity if and only if they manifest relatedness (Box 3)

Figure 11. Capacities and opportunities framework

- **Phase II: Development of Transformative Activities**. In this phase an action plan for the transformative activities is designed, which consist of priorities in terms of actions, policy programmes (funding) and interventions. An important part of establishing a TA in a region is building and gaining the required critical mass, i.e. capacity building.

3.6 Fraunhofer's toolbox for Mission Oriented Innovation Policy

Mission-oriented innovation policy is defined (MOIP) is defined as a cross-sectoral and cross-policy approach to achieving ambitious and clearly formulated goals via the generation and application of knowledge and innovation that address pressing societal challenges.

Their approach is composed of six elements that can be combined and used in a modular way, and its based on work conducted in the development of the German High-Tech Strategy 2025.

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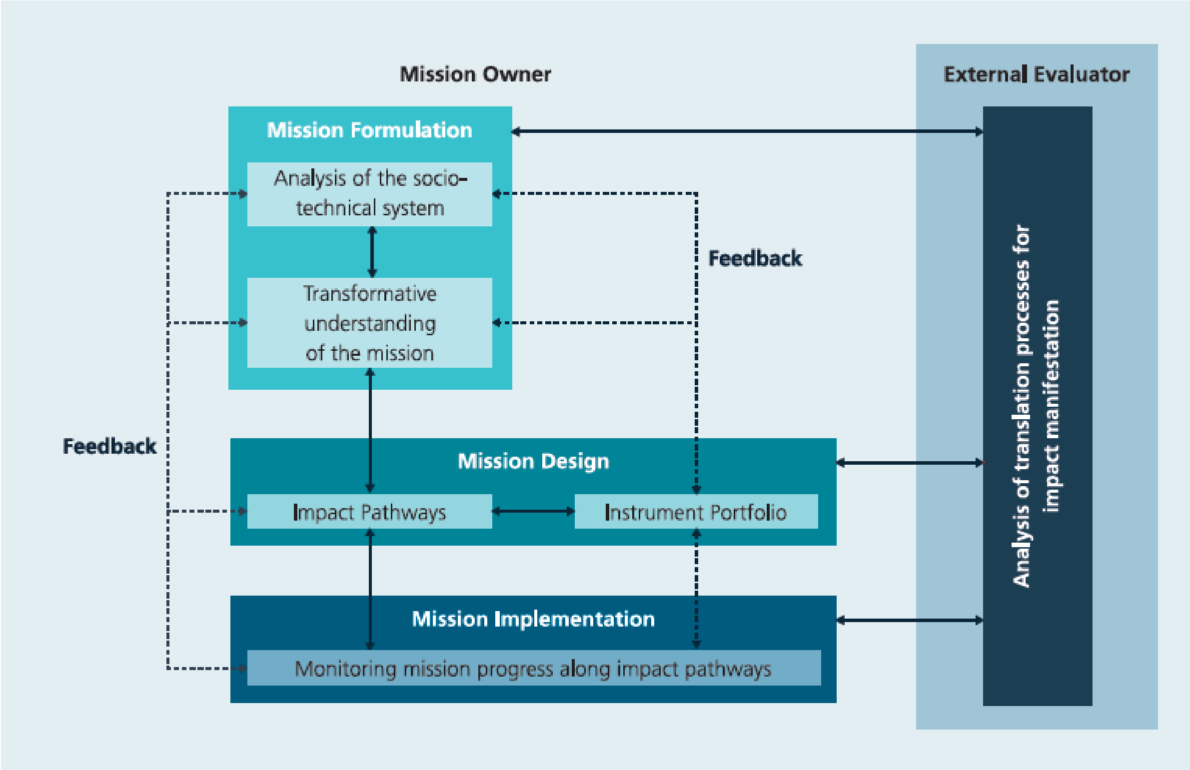

Figure 12. Fraunhofer ISI's toolbox approach to Mission Oriented Innovation Policy. Source: (Wittmann et al., 2022)

i. **Mission formulation**: this step requires the use of systems mapping methods to understand the different elements, actors involved in a specific societal challenge. It also defines what type of "mission" is being formulated. The toolbox introduces 4 types of missions (Table 4), recognizing that missions can vary considerably in the degree to which they seek incremental (accelerator) or transformational outcomes, and whether they are driven by a problem or challenge, or a solution. These different types of missions require different policy and instrument mixes to be addressed, as well as stakeholders.

Table 4. Challenges and characteristics of different types of missions. Source:(Wittmann et al., 2022)

	Accelerator Mission		Transformer Mission	
	Type 1 (A1)	**Type 2 (A2)**	**Type 1 (T1)**	**Type 2 (T2)**
Motivation	Problem-driven	Solution-driven	Solution-driven	Problem-driven
Main logic of change	Scientific/technological change	Bringing knowledge to application	Reconfiguration of sectoral logics	System transformation (incl. behavioural change)
Key Stakeholders	Science	Science, Economy	Science, Economy, collective sectoral actors	Science, Economy, collective sectoral actors, civil society

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Policy Instrument Mix		Mainly STI (distribution)		Mainly STI (distribution, systemic management)		Broad (distribution, regulation, information)		Broad (re-distribution, regulation, information)
Coordination requirements		Limited		Medium		High		Very High

ii. **Mission design**: it starts from identifying the desired mission impacts, impact pathways, and the policy instruments provided to facilitate these impacts by the mission owners. This toolbox provided a set of 11 stylised impact pathways for missions that can be adapted and reformulated to fit individual missions. Accelerator missions include impact pathways based on research and knowledge generation, as well as improving framework and market conditions. Transformer missions include pathways such as market creation, as well changing broader framework conditions, destabilisation of existing regimes, and changing practices and behaviour. Once the pathways are defined, the instrument mix (existing and new policy instruments) needs to be identified.

iii. **Mission implementation**: the implementation of the mission needs to be monitored through indicators developed in relation to each of the impact pathways identified.

iv. **Analysis:** is the feedback loop that occurs between the previous steps, reflecting on how the mission implementation reflects on the assumptions built in the pathways.

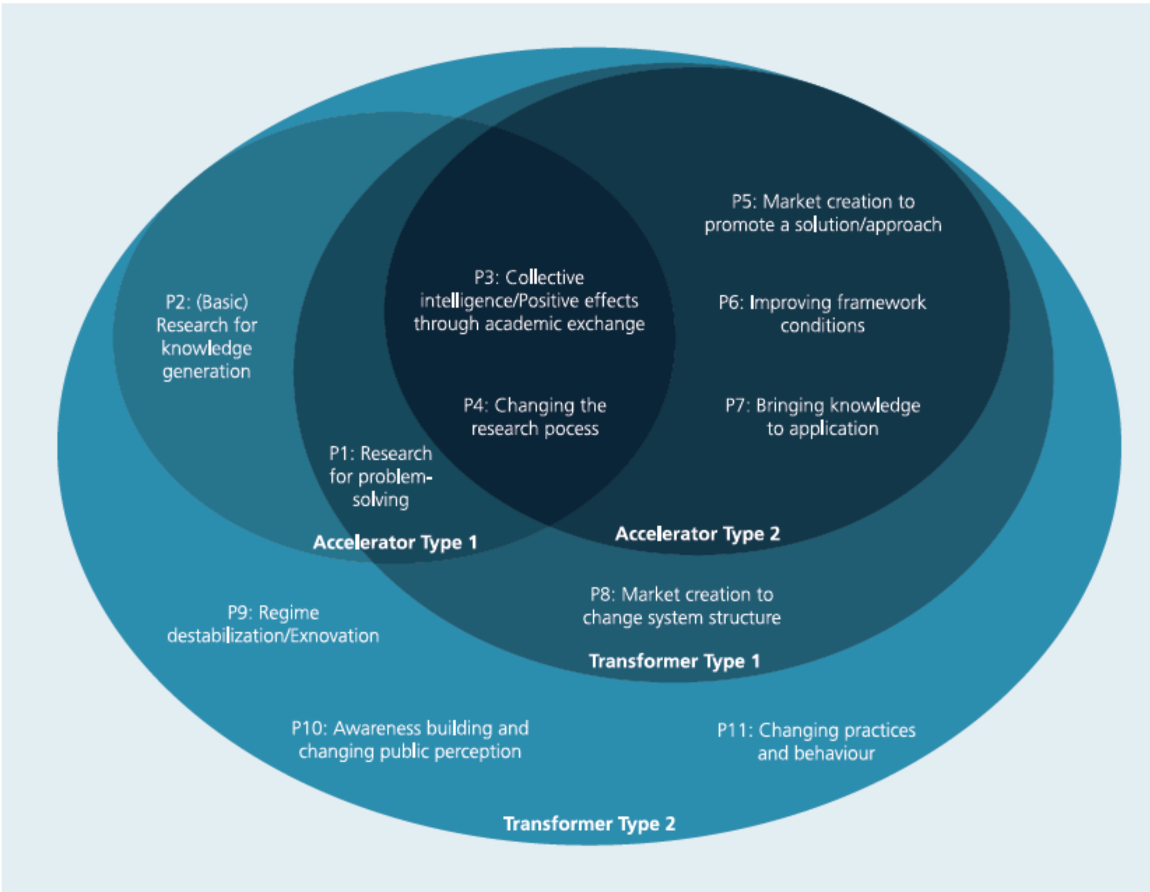

Figure 13. Impact Pathways (stylised) for missions

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4 A proposal for guidance for regions on the development of innovation agendas

In the context of the RRJ, the innovation agenda is an additional lense or dimension that is brought in to support the transition of a region to climate resilience, broadening the focus from climate adaptation to socio-economic resilience. In that sense, the way this IA process is structured follows the logic of the RRJ and borrows from its key elements, incorporating the 5 building blocks described in section 1.4 (vision, baseline, portfolio, governance and learning). This proposal takes different elements from the methodologies reviewed in section 3. The overall structure is based on Inno4SD methodology as well as Climate-KIC's methodology. The innovation portfolio structure is based on OPSI-OECD innovation facets approach, as well as Transformative Smart Specialisation . Considerations regarding the implementation and management of the portfolio are based on OPSI-OECD as well as UNDP guidelines.

Note that this description of the process developing innovation agendas focuses on the *additional elements and qualities* that should be considered. Elements of the RRJ that are already well described elsewhere are only briefly mentioned.

4.1 Step 1. Gather evidence that helps understand what are the strengths and innovation potential of your region

This step links to the "Prepare the ground" step of the RRJ. In this step, region should aim to Identify how the key socio-economic activities are going to be affected by climate change, and whether there are existing climate adaptation plans for each of these sectors, either private and publicly driven.

To understand what are the instruments that can be leveraged for building an innovation agenda, the region should map the existing policy support mechanisms to innovation, either regional, national or EU level (S3 strategies, cohesion funds, regional or national R&I plans, etc). For each of these instruments, it is necessary to assess whether they include explicit "directionalities" related to climate adaptation and/or KCS. In the process, it is important to hear directly, when possible, from the different agencies and institutions that drive the implementation of these policies. It is important to understand how different agencies involved in innovation, economic development and KCS work together, and what is their capacity for innovation, experimentation and learning.

Understanding the innovation capacities of a region is best achieved by connecting directly with local experts (from the public sector and/or academia) who are familiar with the topic, and can help map the capabilities, assets and infrastructures of that region that support that economic and innovation activities. These should consider not only climate adaptation related R& but go broad, including those related to key socio-economic activities and frontier research and innovation (i.e. digitalisation, material science, biotechnology, others). Particular emphasis should be given to KEC such as finance, governance and experimentation

Example: In a coastal city, one of the main adaptation problems could be increased flooding due to rising sea levels. Economic activities directly affected by this impact are fisheries, tourism and ports. Indirectly this will affect agriculture due to land salinisation, as well as other economic activities that due to disruptions to infrastructure and health & wellbeing of citizens. In addition to the baseline assessments conducted for the RRJ, the region should assess whether and how the strategic innovation plans (if

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presents) for each of these sectors are considering the climate adaptation dimension. These plans might sit with industry associations and/or local government agencies (for instance, agricultural support).

When assessing policy instrument and innovation capacities, the region contacts the local university that shares their existing studies on the innovation capacities of different industries, surveys of skills of workers, as well as their assessment on the impact and opportunities that new trends and technologies may bring to the region. While this is not directly connected to climate adaptation, it is an important background to understand where and how to innovate.

4.2 Step 2. Define a vision for your climate adaptation strategy and it's directionalities

This step links to "build a Shared vision" step of the RRJ and "identify and assess options" substep within the step "define pathways".

When identifying levers of change to construct possible future scenarios for your region, include also "seeds" or "niches", that is, social, technological and/or public innovations currently emerging in the region, that can have high impact in the economy, society or the environment. Some of these "seeds" can become part of the innovation actions of the innovation portfolio.

The region should strive to develop a vision for climate adaptation that is broad, systemic enough to consider how the socio-economic and socio-ecological system of the region transform and thrive in response to your climate risks. The vision should not only consider not only those systems or sectors that will be directly impacted by your climate risks (such as water, food, energy) but also the impacts on related systems (health, key productive activities, etc.).

It is important to identify the different directionalities that support your vision and that can inform the choices of your IA. These refer to specific challenges or goals that are included in your vision that cut across various systems and sectors. For example, a directionality can be "healthy ageing population" – which might be relevant if your region has an ageing demographic that will be strongly affected by climate risks such as heat waves. When thinking about directionality, take a transitions perspective in defining the directions that support your vision, this mean, consider not only the creation and scaling of innovation, but also the discontinuation of activities that are detrimental to the climate resilience of your region (i.e. what needs to flourish? What needs to diminish?)

Following the example, when stakeholders in the region engage in a co-creation process for the region, they also consider what currently local innovators are doing as "seeds" for change. For example, there might be a group of start-ups working on salt-resilient crops, or on solutions to obtain drinking water from saline water. These "seeds" can be used to inspire potential future scenarios.

The directionalities of the vision are the more specific goals that the region seeks to achieve. For instance, a directionality can be "resilient water supply system". Note that directionalities are related, but not limited to, the adaptation pathways. While some might be directly connected to a pathway, others can be broader, for instance, a directionality can be "digitisation of the port and agriculture sector for better climate resilience".

4.3 Step 3. Define a process to structure and populate your innovation portfolio

This and the following steps refer to the sub-step "co-design a portfolio of interventions" of the RRJ.

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Once the region has defined its climate adaptation pathways and options, it can start working on the associated innovation portfolio. The innovation portfolio supplements the options selected. To structure the different innovation actions in your portfolio, we suggest to look at the different directionalities that are part of your vision, and map within them the innovations actions that can contribute to address them. These directionalities should be aligned with the objectives of the adaptation pathway and intervention(s) that the region has selected, and serve to enable your intervention(s) and catalyse its co-benefits.

The process to define and select the innovation portfolio is often a process where private sector and citizens are invited to contribute with their ideas to address the selected directionalities. In this case, the regional government does not a priori identify and select innovations, but instead, seeks to provide incentives for these innovations to flourish (see Step 5). This can be done through an (i) open call for innovations that can contribute to the goals of your climate adaptation strategy, followed by a (ii) collaborative workshop with key and diverse stakeholders in the region where you conduct an "open peer review" process of the innovations presented and define which ones to support (see (European Commission et al., 2023) for examples of such process). The innovation portfolio should include innovations as well as those actions required to be able to take advantage and scale those innovations, for example, actions related to skills upgrade or infrastructure development that the region could take to increase the impact of a certain technological opportunity. Some of these innovation actions might be in the future, including mid and longer term plans.

Within your criteria, consider that not all "innovations" need to deliver concrete products or services in the short run. Following an adapted version of the OECD's facets approach, we suggest to consider the following types of innovations:

- ***Enhancement oriented innovation*** that focuses on upgrading, achieving efficiencies and building on existing structures. These innovations might lead to results on the short run but will most likely not enable long-lasting solutions for your adaptation challenge. Also known as incremental innovation. *In the example: improved irrigation practices will sustain your vineyards for some time, but not in the long run.*
- ***Adaptive innovations*** that allow you to try and test new approaches that will make you capable to adapt to a changing environment. These innovations will help you understand better your challenge and might bring insights that will require you to reformulate your portfolio. *For example, innovations related to new climate monitoring systems that collect new data and insights; or innovations in the way in which public sector operates that allows more agile responses to climate emergencies or other public challenges.*
- ***Anticipatory innovation*** are innovations that allow you to explore how the future would look like for things that are not yet there. These can be innovation related to frontier research, but also social innovations that seek to explore radically different ways of organising society. These innovations tend to have more transformative potential.
- ***Exnovation,*** or the discontinuation or phasing out of unsustainable practices and technologies.

Note that these different types of innovation are meant to complement each other in the portfolio and over time.

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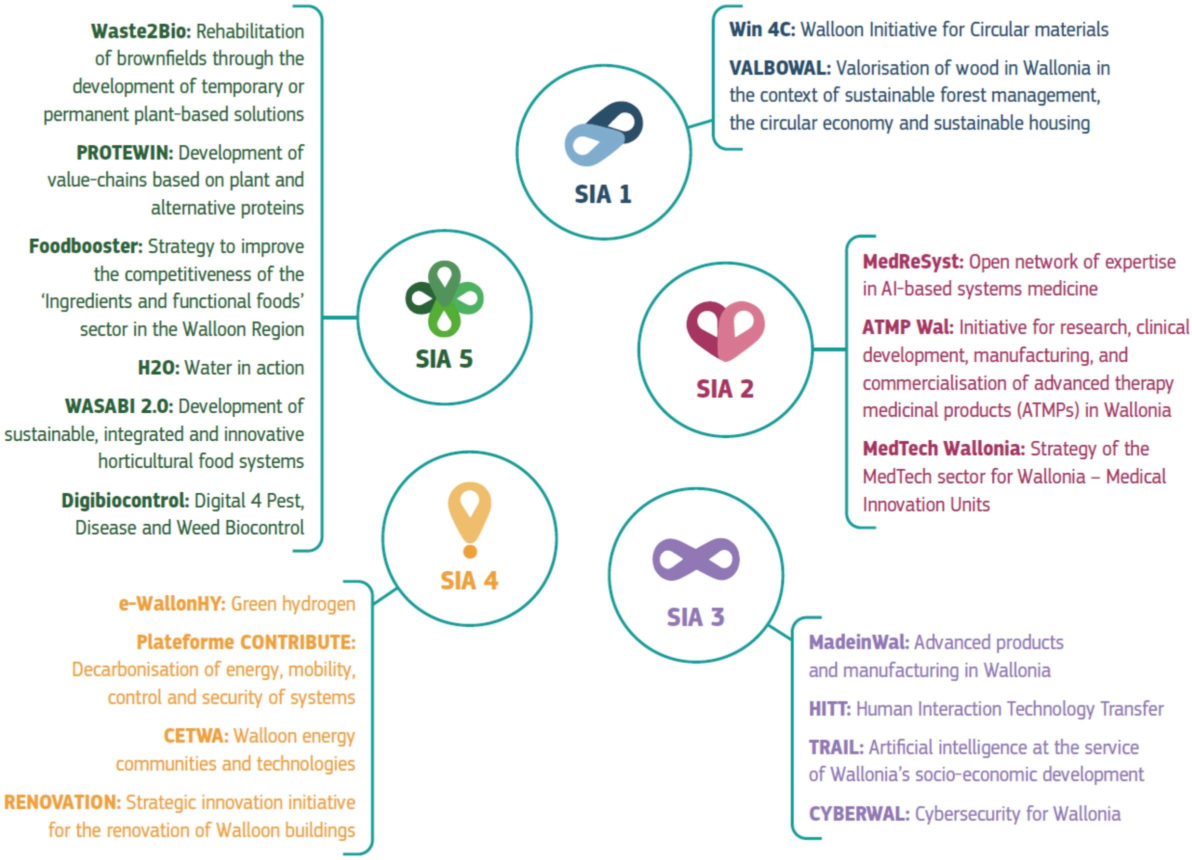

Figure 14. Innovation Portfolio of Wallonia. In this case Strategic Innovation Areas (SIA) are SIA1:Circular Economy, SIA2:Innovation for enhanced health , SIA3 Agile and safe design and production methods:, SIA4:Energy Systems and Sustainable Habitats, SIA5: Agri-food chains of the future and innovative environmental management. Source: (European Commission et al., 2023)

For example, the region has selected the options: (1) promoting sustainable and restorative use of ecosystems; implementing zoning regulations to control development in vulnerable areas, and (3) establishment of early warning systems. Each of these options can be supplemented with a set of innovative activities (the innovation portfolio), which are driven by the private sector, citizens, as well as innovations within the public sector.

The region decides to run an open call where for the option (1) promoting sustainable and restorative use of ecosystems and (3 establishment of early warning systems), because these are the areas where they can see more alignment with their innovation goals that seek to enhance digitalisation and applied ecological practices in the region. Different stakeholders bring in their ideas, and these might include business ideas, but also citizen led initiatives around citizen science for ecosystem restoration, or initiatives from public sector institutions regarding how to incorporate early warning systems into healthcare or water management.

The, a workshop is organised where a diverse set of stakeholders define which innovations take are included in the portfolio. The guiding questions can be:

- *What innovations can ensure that the region's heritage and deep knowledge of its ecosystem is passed to future generations?*

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- *Which economic activities can be developed in the context of a new climate in the region, given the skills and tacit knowledge of its inhabitants?*
- *How can we ensure that the benefits and risks of these changes are equally distributed?*

The innovations selected should cover the 4 types of innovations identified earlier, and also should aim to work together. So, for example, if a start-up that is using AI to develop soil restoration programmes tailored to specific communities is selected, this can be coupled with a farmers-led initiative to experiment with different soil restoration techniques.

4.4 Step 4. Build your innovation portfolio and assess its quality

Note that before populating your portfolio, it is important to have clarity of the finance and resources available to support portfolio activation. Your innovation portfolio is one of multiple components of your adaptation finance plan, but it is important to align the stages of implementation of your portfolio with the availability of resources that you have identified earlier.

The rule of thumb on how many innovation actions should compose your portfolio is given by your ***capacity to support*** these innovations (support through funding, mentoring, among others) as well as monitor their progress over time in relation to your adaptation challenge, vision and directionalities. The number of innovations will also relate to the number of ***interventions*** that your region chooses to conduct. Remember that the portfolio will go through a series of iterations and can be expanded or change over time, so it is advised to start with a number and mix of innovations that can be managed by the organisations that are on board in your process.

The directionalities linked to adaptation pathways give you a way to "map" the innovation actions that will constitute your portfolio. You will have different "sets" of innovation actions that, together, address different aspects of your challenge and intervention and unlock more transformative solutions.

How to assess whether the innovations that you have selected for your portfolio are the right ones? We suggest to use the three following criteria.

i. **Potential for Amplification (Scaling)**: assess whether the innovations in your portfolio are scalable and what is required to do so. Following Lam et at (2020) classification, we suggest to look at:
    a. Amplifying within: whether the innovations can be conducted for longer term or faster
    b. Amplifying out: doing the same or a similar (adapted) version of your initiative in other contexts.
    c. Amplifying beyond: how the innovations in the portfolio change rules (beliefs that we use to define what is the "best way" of doing something) or values.

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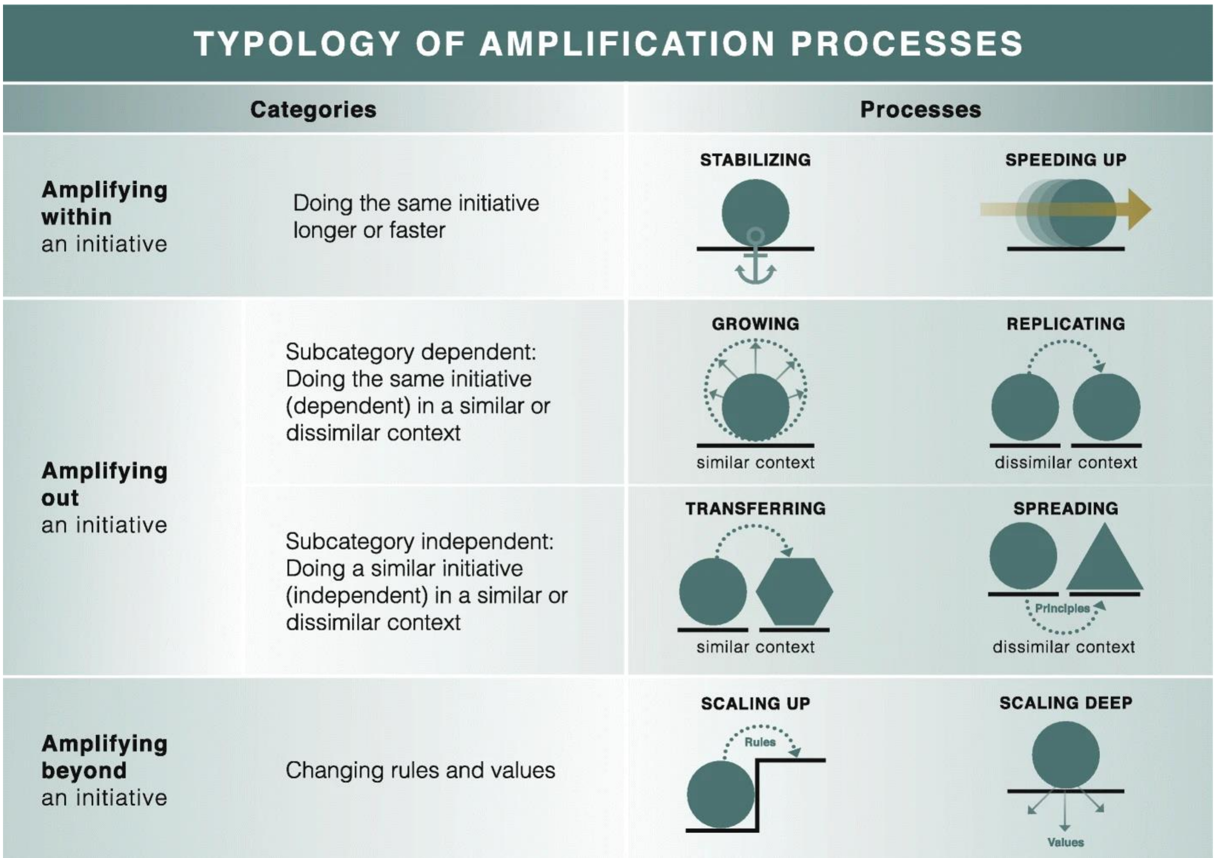

Figure 15. Different types of amplification (scaling). Source: (Lam et al., 2020).

ii. **Synergies**: the main goal of a portfolio approach is to create results that are more than the results that each innovation can achieve individually. In this respect, it is essential to understand whether and how the innovations in the portfolio can create dynamics of pooling between actors in such ways that might create economies of scale or increase implementation feasibility? Synergies can be financial, capacities (human resources), improvements in infrastructure, data (collection or quality) and knowledge and competences. For climate adaptation is also essential to consider potential, negative synergies that might emerge from the portfolio (i.e. maladaptations).

iii. **Risk vs Return**. We also recommend to find a balance of risk vs return that is suitable to your regions at a given time. While transformational innovations are needed, these might take longer term to generate results, and often “quick wins” are needed to create momentum and maintain the legitimacy of your activities. There will be a balance in risk vs return in your portfolio if you already considered the 4 categories of innovations introduced earlier (enhancement, adaptive, anticipatory and exnovation), but chose a portfolio that reflects the ambitions of your adaptation pathway, but also meets the expectations and needs of key stakeholders.

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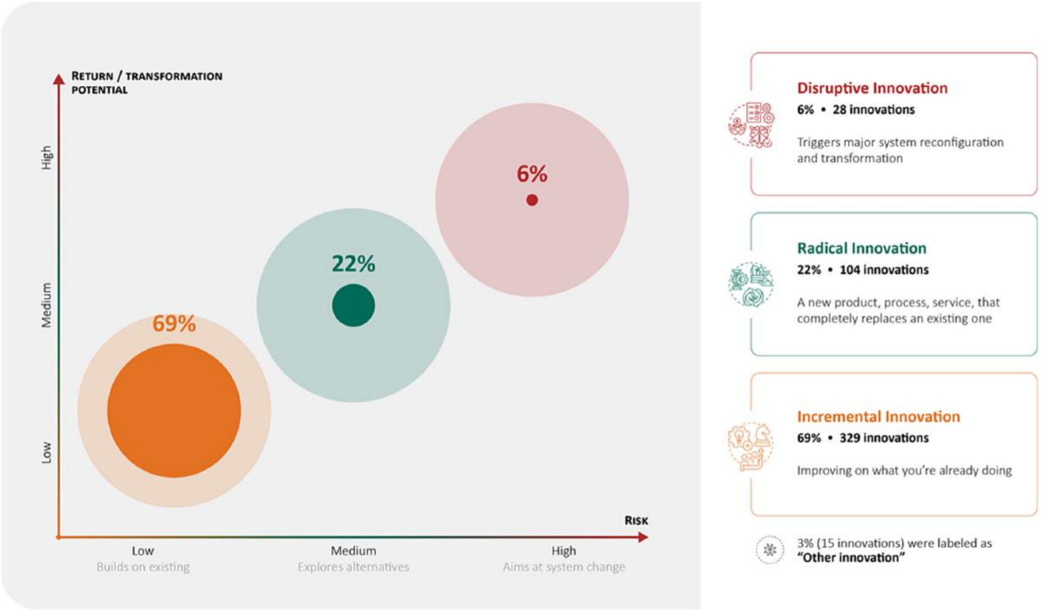

Figure 16. Portfolio composition from CGIAR in 2022 (. Source (Schut et al., 2024)

Following our example, the portfolio mix includes a variety of innovations, private, public and from citizens, aimed at soil restoration. Some of these innovations are very early stage and hence more risky, but have the greatest potential in terms of soil restoration, as well as in delivering co-benefits. Others will yield results in the short run and can pave the way for innovations that are more at an earlier stage.

4.5 Step 5. Identify the policy and governance mix that supports the implementation of your innovation portfolio

The public sector has a variety of policy instruments that can be leveraged to support the implementation of your portfolio. But given the multi-agency and long-term nature of your adaptation pathway, a policy mix should not only focus on the instruments, but also the different mandates, logics and strategies of the different agencies involved. Each agency has a different way of "seeing" and hence targeting a problem, and different ways of assessing "success". Hence, a policy mix approach also helps you creating mutual understanding and alignment between the different public sector parties involved. Note that for EU regions is particularly relevant to consider EU level policy strategies, such as the Green Deal and the EU Missions, as well as Cohesion Policy, Recovery Funds, etc.; and overall, embed your policy mix in the different policy development opportunities available. Some regions might have a Smart Specialisation Strategy (S3) in place, which might be a good starting point to envision and articulate regional diversification and climate resilience, but note that the focus of the RRJ is much broader.

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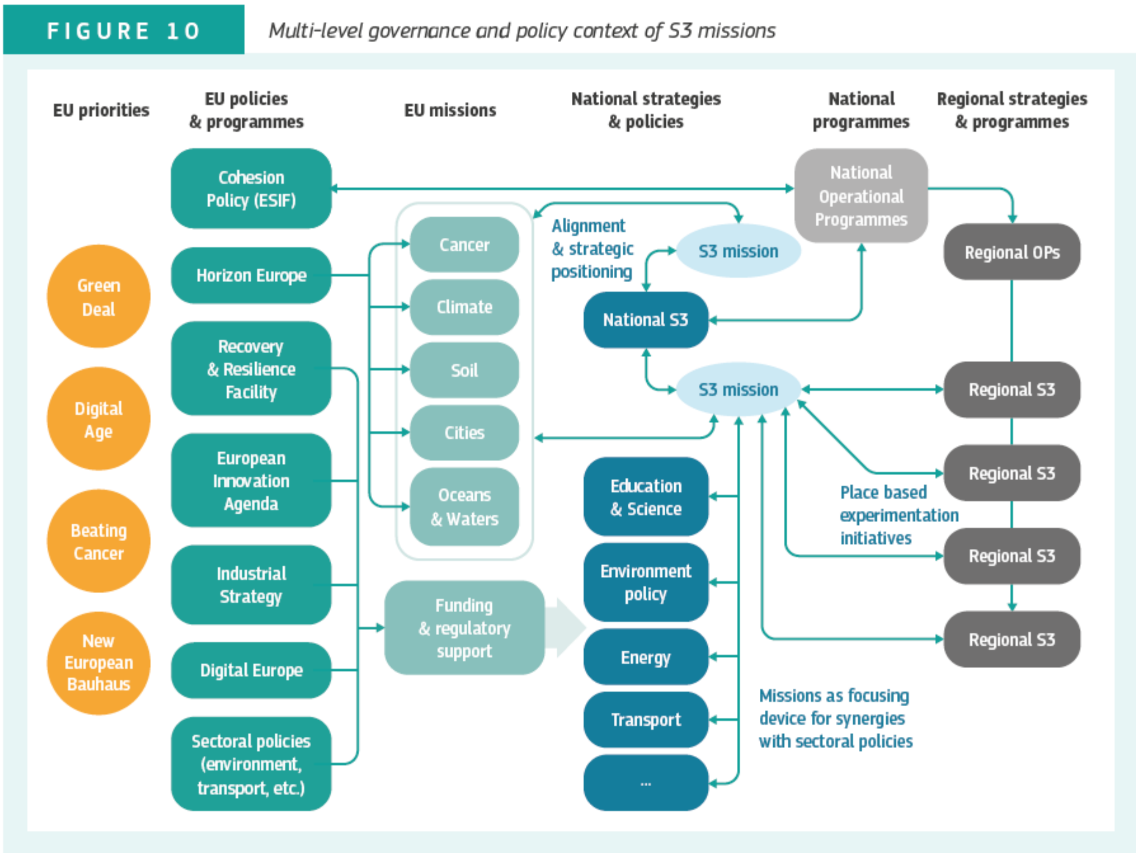

Figure 17. Example of Policy mix and multi-level governance of a variety of policy goals and strategies. Source (European Commission et al., 2023)

- Policy strategies include the policy objectives and the plans to materialise them. For European regions, relevant policy strategies can be found at EU (Green Deal), National (Adaptation Plans, Research and Innovation frameworks), and regional level (S3). See Figure 16.
- Policy instruments associated with a specific goal and design features. Policy instruments can cover (see Table 5 for a more detailed overview).
    - Supply: support to R&D, support to venture and seed capital, support to technology transfer, support shared R&D infrastructure, competence building and skills upgrade.
    - Demand: public procurement, living labs, incentives, regulation (inc. sanctions and disincentives), codes of conduct, public communication, etc.
    - Ecosystem instruments: cluster development, innovation platform, flagships or consortiums, support to intermediaries, etc
- Policy processes, which refers to the relationships and decision-making processes that take place to achieve this mutual alignment and architecture of your policy mix. This refers to the "governance" of your policy mix.

Table 5. Policy instruments to support innovation for sustainability. Note that this list of policy instruments includes both national and regional level instruments. Source:(Adapted fromUNCTAD, 2019)

Regulatory Framework	Policy instrument	How can they support innovation for sustainable development?
	Environmental and health protection regulations	Provide incentives to innovate to comply with regulatory framework (e.g. substitution

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		of harmful chemicals). Provides disincentives for free riders by introducing penalties
	Product and industrial process standardization	Provide incentives to innovate to comply with environmental and social performance standards for products and processes
	Consumer protection, labels and certification	Promotes innovative products and processes by providing information on environmental and social performance of products and services to customers
	Intellectual property rights	Encourages firms to engage in innovation activity by protecting their knowledge; and opens access to knowledge and technologies contributing to sustainable development
	Competition Law	Prevents the emergence of monopolies or cartels that can stifle innovation and hold back its benefits for consumers or the environment
	Bankruptcy Law	Can help to engender a risk-taking, entrepreneurial culture, protecting investors, firms and consumers against some of the negative effects of failure
Economic instruments	R&D funding	Provides direct support for R&D underpinning sustainable innovation
	Innovation funding for companies	Provides direct support for innovation activities aiming in the areas relevant for sustainable development
	Equity support to venture & seed capital	Provides equity dedicated to innovation; de-risks innovation investments
	Feed-in-tariffs and similar subsidy schemes	Provides financial incentives to adopt and diffuse innovative technologies in selected technology areas (e.g. renewable energy)
	Tradable permit systems (e.g. emissions trading)	Allocates or sells emission rights to polluters which can be traded. The price for emission rights and prospect of reduction of emission rights creates incentives for innovation
	Removal of subsidies for unsustainable activities	Removes distortion from markets that inhibits sustainable innovation (e.g. subsidies for fossil fuels)
Fiscal instruments	Tax incentives for R&D for companies	Tax reduction (CIT) for companies undertaking R&D underpinning innovation
	Tax incentives for technology adopters	Tax reduction (CIT) for companies adopting innovations with environmental and social benefits
	Environmental taxation	Tax reduction (CIT) for companies undertaking R&D underpinning innovation
	Removal of tax reliefs for unsustainable activities	Removes distortion from markets that inhibits sustainable innovation (e.g. subsidies for fossil fuels)
Demand support	Sustainable public procurement	Creates markets for goods and services with positive impacts on the local community in the areas relevant for sustainable development (e.g. Green Public Procurement)
	Pre-commercial procurement (R&D and innovation procurement)	Creates markets for innovative goods and services and stimulates experimentation of new application of emerging technologies
	Support to private demand	Provides incentives (e.g. vouchers) for consumers to purchase innovative goods and services with demonstrated positive social and environmental impacts
Education and training	Adaptation of formal education curricula to address the SDGs	Adapting higher education and vocational training curricula to consider sustainable development challenges. The curricula may be developed jointly with industry and other organizations. Provides qualified and skilled workforce
	Placement schemes and staff mobility	Supports learning, knowledge exchange and connections between actors in the innovation system with a focus on actors active in promoting sustainable innovation

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Regional Innovation strategy & networks	Clusters, industrial zones, and science and technology parks	Encourages smart specialization in innovation and technological areas relevant for societal challenges in regions with high potential and/or need for goods and services with environmental and social benefits
	Technology platforms and networks	Promotes information and knowledge sharing on innovation
	Roadmaps and technology foresight	Creates shared vision, commitments and roadmaps for experimentation, investment and development of eco-innovation, "wires up" the innovation system
Capacity building and information provision	Business advisory services	Promotes skills and knowledge relevant for innovation
	Local entrepreneurship and business incubation	Promotes local entrepreneurship and local innovation
	Technology transfer and matching	Promotes identification and acquisition of innovative technologies relevant for tackling specific challenges
	Capacity building for governments	Promotes building up government capacity to design, implement, coordinate and evaluate STI policy with a view of its support for sustainable development
	Market intelligence services	Promotes information, data and knowledge sharing on innovation trends related to sustainable development (reduces information asymmetry)
Information and cultural instruments	Education and awareness raising	Campaigns or programmes can 'popularize' science, technology and innovation and – if appropriately designed – enhance democratic inputs to innovation policy
	Network facilitation and enhancement	Aids lesson learning and sharing e.g. events such as Failure Nights, Start-up weekends etc
	Virtual and material infrastructure/ events for innovation network-building	Hackathons, maker spaces, transformation labs

In the example, the region decides to use a combination of supply -side instruments (direct support to early stage innovations in soil regeneration), demand-articulation (fund coordination efforts among farmers), as well as ecosystem and capacity building tools (creates a digital, open platform for soil information which others can build on, and trains innovators and communities on how to use it. The policy mix depends on different agencies, from agricultural and land use, to agencies related to knowledge and innovation, which need to work and coordinate together.

4.6 Step 6. Monitor and evaluate the performance of your portfolio, and adapt accordingly

To monitor the progress and implementation of your portfolio, we suggest to conduct three process.

First, to create a "dashboard" and/or report where you summarise how your innovations individually and as a whole are performing regarding the criteria that you have selected (amplification, risk vs reward, synergies) and in relation to the adaptation challenge and its directionalities. The dashboard will provide you with a "picture" of the current state of your portfolio and its potential, and should include key metrics that can indicate the performance of the policy instruments that are being used (R&D spending, growth of companies, etc), as well as

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how they respond to the criteria of your portfolio defined in Step 5 and your adaptation challenge.

Secondly, evaluate whether the policy mix that you have put in place is supporting the implementation of your innovation portfolio in line with its intended outcomes. Question that can be asked are:

i. Is the policy mix coherent with other interventions within the RRJ/intervention pathway?
ii. Is the policy mix efficient in terms of resources? Is it effective to achieve the desired goals?
iii. Does the innovation agenda have the right support among different public and private stakeholders involved and affected by its implementation, including citizens?

Last, there are many "learnings" based on experience and insights from those working on the portfolio implementation and how addressing the adaptation challenge. Often these methods are best suited to capture unexpected and unintended (positive and negative) outcomes, given that you involve a diverse set of stakeholders in the process. These "soft" insights are equally relevant and can be triangulated with other forms of data to ensure they reflect real changes. Methods that can be used are "Most Significant Change" our "Outcome Harvesting".

Taken these three inputs together, decide on changes and adaptations to your innovation portfolio and supporting policy mix. Note that it is important that this process is collaborative and transparent, as it will keep the momentum and enhance the mutual alignment between the different agencies and stakeholders involved in the implementation of your innovation portfolio.

In the example, the region creates a "dashboard" where they look at how much publications and patents relevant to the challenge created in the region, growth of the companies supported, collaboration between companies as well as with other stakeholders, and compared to metrics related to the adaptation challenge such as soil quality. In addition, they conduct a rapid, formative evaluation to assess whether the portfolio implementation is working as intended, what challenges are different stakeholders and agencies are facing, and how to overcome them.

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Conclusion

Based on the review of different innovation agenda methodologies, this document has proposed a general guidance on how to conduct this process in alignment with the development and implementation of climate adaptation pathways. It has highlighted how an innovation perspective can be integrated in the different steps of the RRJ, and what is the value added it brings to climate adaptation in terms of levering the efforts and intelligence of the private sector and citizens, as well as augmenting the co-benefits of the pathways selected.

A more application oriented version of this document will be included in the Guidance (Deliverable 6.3), which will detail more concretely the steps that regions can take in order to develop their innovation agendas.

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